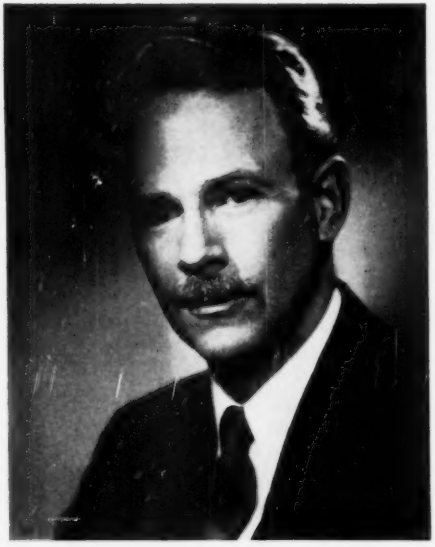
PUBLIC WORKS

city county and state

August 1950



W. Victor Weir. President of the American Water Works Association, is also President of the St. Louis County Water Co. and the Missouri Water Co., both of St. Louis. Born a Hoosier, he was graduated from Washington University in 1923 with a BS in CE. He has been in the water business pretty much all of his life, having been Engineer, Assistant Manger, Chief Engineer, Superintendent, VP and GM and then President in 1946 of his company. In addition to the AWWA, he has membership in the ASCE, Missouri Professional Engineers and St. Louis Engineer Club. He has belonged to AWWA since 1924 and has been active in many phases of the Association's work. He is no relation to those two other good water works Weirs—Paul and Bill from down Gawgia way.

Layouts of Vacuum Sludge Filters

How to Use Motor Graders For Ditching

Elevated Storage Induces Pumping Costs

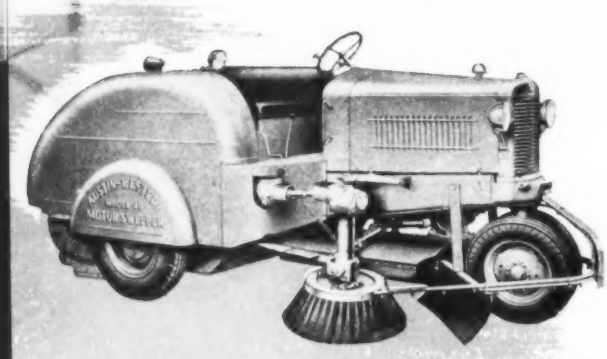
Pavement Design for Bus Stops

Modified Primary Sewage Treatment

Small Water Treatment Plant Design.

Get a MODEL "40" with its

Three-Wheel Design • Front Steer and Hopper at Rear



The Model "40" may be had with either right hand or left hand gutter broom, or both; also with windshield and steel cab.

On any street, there are many things the operator of a sweeper has to watch, and with the Model "40" he sees them all. Only with this sweeper does he have unobstructed view of everything around him. There are no "blind" spots for the man behind the wheel of a Model "40."

Children don't always watch where they're going. Thanks to front steer and rear-mounted hopper, the Model "40" operator can do the watching for them, because he sits in the *natural* place "up front" where he can see what's going on.

And there's another important angle . . . not only can he operate the Model "40" *safely* but *efficiently* as well, because it's the only sweeper with gutter brooms visible at all times.

Yes, for efficiency's sake as well as safety's sake . . . GET A MODEL "40."

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BUILDERS OF ROAD MACHINERY

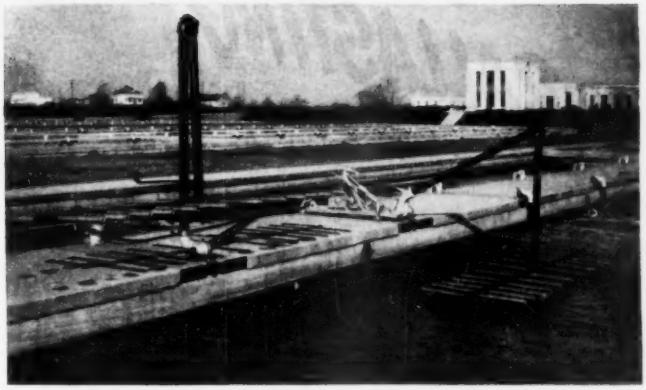
Austin Western

SINCE 1859

THE OVERWHELMING MAJORITY *specified* "CHICAGO" SWING DIFFUSERS AND PRECISION TUBES

Sewage Treatment Plant
Columbus, Ohio

Paul A. Uhlmann & Associates
ENGINEERS



THE overwhelming majority of Consulting and Design Engineers who planned equipment for Activated Sludge Sewage Treatment Plants in the past five years specified CHICAGO Swing Diffusers and Precision Diffuser Tubes. It's a question of "Diffused Air Economics". Continuous operation of an Aeration Battery is possible only with Swing Diffusers. The most economical operation is possible with Precision Diffuser Tubes.

What Plant Operators Say

- Low first cost.
- Continuous performance without extra tanks.
- Economical operation—less power consumed—less labor.
- Tubes easily and economically cleaned.

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SEWAGE EQUIPMENT DIVISION

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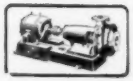
Flush Kleen, Scru-Peller, Plunger, Horizontal and Vertical Non-Clogs Water Seal Pumping Units, Samplers.



Swing Diffusers, Stationary Diffusers, Mechanical Aerators, Combination Aerator-Clarifiers, Comminutors.

When writing, we will appreciate your mentioning PUBLIC WORKS

AN Exclusive FRINK FEATURE

SELF-BALLASTING

Only in the Frink do you get Self Ballasting of the nose plow — by utilizing the weight of the snow being removed, to prevent side slippage of the front wheels on the truck.

This is accomplished by using drive bars pivoted at both ends and by suspending the rear portion of the nose plow from the truck attachment by means of adjustable heel chains. An exclusive Frink Feature.

Thus, instead of putting additional weight in the nose plow, the down pressure from the snow sliding over the moldboard is used as ballast for the front end of the truck—only while, and in direct portion to the depth of, the snow being removed. This "snow ballast" is not carried as dead weight from one job to another.

The same exclusive feature which makes the Frink self ballasting also prevents side slippage of the front wheels—that's why experienced snow plow operators prefer the Frink for those toughest jobs of snow removal on highways and airports.

These, and many other advantages, are made available to you by Frink's advanced engineering. They are found only in Frink.

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THE ENGINEERING AUTHORITY IN THE CITY-COUNTY FIELD

Edited by

W. A. HARDENBERGH and A. PRESCOTT FOLWELL

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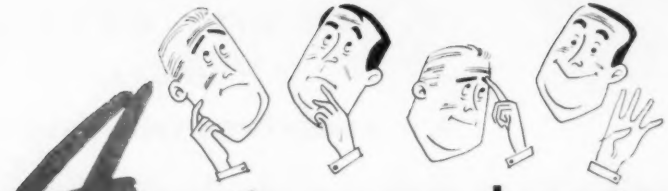
The 1950 volume of Public Works will be available on microfilm through University Microfilms, 313 N. First St., Ann Arbor, Mich.



4 questions every dump truck user should ask about new International 6-wheelers

QUESTION: "I hear new Internationals are heavy-duty engineered. What does that mean to me?"

ANSWER: "Heavy-duty engineered" means that extra stamina and durability are built into every one of the thousands of parts that go into new International 6-wheel Trucks. This gives you the long life and savings in operation and maintenance that have kept Internationals first in heavy-duty truck sales for 18 years.

QUESTION: "What other assurance do I have that new International 6-wheelers will do a good job on *my* particular job?"

ANSWER: From new valve-in-head engine to new bogie assembly, every new International 6-wheel Truck is *specialized* for years and years of outstanding 6-wheel truck performance. In addition, every model has been *proved* right from every standpoint in actual 6-wheeler operation.

QUESTION: "What do new Internationals offer in the way of new advancements?"

ANSWER: You get the new Comfo-Vision Cab—"roomiest cab on the road." You get the new third differential that eliminates the need for an extra propeller shaft and a power divider, thereby reducing truck weight. You get new Super-steering and new Super-maneuverability for easier handling and turns in the shortest practical circle. You get a new valve-in-head engine, new frame, new improvements from bumper to tail light.

QUESTION: "Where can I find out *more* about how new International 6-wheel Trucks will cut my hauling costs?"

ANSWER: Get in touch with your nearest International Truck Dealer or Branch. He'll gladly give you facts and figures on the right 6-wheel model for you.

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INTERNATIONAL HARVESTER COMPANY CHICAGO

When you need special information—consult **READERS' SERVICE DEPT.** *on pages 85-89.*

THE EDITOR'S PAGE

A City Engineer Writes An Editorial for Us

"WE need a lot of things, including more help in the Engineering Department. We need a considerable amount of equipment, including a building to house the same. As time goes on we have more people, more inhabitants, more demands for the 'more abundant life' and less and less money to buy the means of furnishing the same. Construction costs have increased 2½ times and the citizens do not want any increased taxes. In fact, they demand that they be lowered so they can pay the Federal income tax and the State sales taxes and income taxes.

Up to now I have been unsuccessful in getting people to work for nothing, and to get manufacturers to donate new equipment to us. People will pay $15,000 for a house which pre-war would cost $7,000 or possibly $6,000. But they complain no end because sewers which formerly cost $1 per foot now cost $2.75, and sidewalks which cost 25 cents a foot are now 50 cents. Concrete paving which was $2.50 is now $6.00 per yard. They hold the view that the contractors are all thieves and robbers and the engineers are in collusion with them. They pay brick layers and carpenters $16 per day and at the same time raise hell because the engineer pays $1 per hour for technical assistants.

Outside of these few inconveniences, we are doing as well as could be expected."

Peeves and Gripes

ONE of the good ideas we have heard about recently is the "pet peeve and gripe week" that has been initiated by the Director of Public Works of East Hartford, Conn., George J. Penney. There is more to the idea than just affording the good citizens a chance to get it off their chests, though lowering the community blood pressure by giving the folks a chance to let off steam is a most praiseworthy objective.

As a sort of guide to gripers and peevers, Mr. Penney has suggested a number of good topics that ought to help them get into championship swing. On the other hand, these topics are chosen pretty carefully, it seems to us, so that there ought to be some constructive criticism mixed in with the tomatoes and brickbats that are sure to come. Among the subjects tossed out for discussion are: Hazardous street conditions, and messy vacant lots; street lighting and how to make it better; rubbish and refuse disposal; improvements in public works; improvements in town services; sidewalk improvements; improvement of traffic conditions; dead tree removal and tree planting; and general beautification of the town.

We think Mr. Penney has done a very wise thing, and we are sure that among the things that are going to be heaved his way during the two-week gripe period that is coming, will be some very worthwhile suggestions. Local folks have a way of coming up with such suggestions more often than many of us think or realize.

Korea and The Present Status of Public Works

QUESTIONS have arisen in regard to the status of public works due to the war in Korea. PUBLIC WORKS has been in contact with responsible officials of the Government in Washington. Obviously, the situation is uncertain, but the present attitude is basically this: On essential public works, such as sewerage and sewage treatment, highway construction, water supply and purification, and refuse disposal, there should be no hesitation in going ahead. In the case of recreation facilities, grandstands and similar structures which are scarcely essential, hesitation may be in order. As one important official put it: "It is just as important for workers employed in a plant manufacturing defense materials and equipment to have adequate water, sewerage facilities, etc., as it is to produce the specific commodity they are manufacturing." The same applies to highways, which are essential in transportation.

In other words, facilities which will contribute to the national health and ability to function more efficiently, will be just as valuable in case of a greater emergency as they will be if no such emergency arises. On the present basis, which is of course subject to change, these projects should not be curtailed.

Fluorides for Better Teeth

MUCH has been written about the desirability of using fluorides in public water supplies in order to reduce the tooth troubles that so many people have to go through. There are now some thirty cities, maybe more, in which fluorides are being added to the water under the supervision of dental and public health authorities. We believe that none of these has been in operation more than perhaps four years. Several years more will be required to provide scientific proof that the addition of fluorides is definitely preventive as regard tooth cavities and will have no undesired after-effects.

There is a wide desire for additional information on this subject, and in our September issue we will publish a long list of questions, with authoritative answers to them. These questions will cover, we believe, what every water works man will want to know about fluorides, the forms in which they are used, what it is believed they will do and how they can be applied.

Will Sodium Fluoride help preserve this smile?

Water Fluoridation

THANKS TO dental research on ways of reducing tooth decay, more and more of our children will grow up with sound, strong teeth. For example, one phase of present-day research is indicating that Sodium Fluoride may become an important weapon for combating tooth decay

FOR SEVERAL YEARS, a number of communities have been adding Sodium Fluoride to municipal water supplies low in natural fluorine content. Preliminary reports indicate a 25 to 30% lower rate of tooth decay among children drinking these treated waters.

Regular Dental Care

FROM SUCH STUDIES, dental, municipal, and public health authorities will shape plans for the future—possibly extend these preventive measures to scores of other cities and towns the nation over.

• • •

From municipalities using its Sodium Fluoride, General Chemical has gained considerable knowledge of the mechanical aspects of water fluoridation. Its Technical Service is available to officials considering similar programs. For additional information, consult the nearest General Chemical office listed below.

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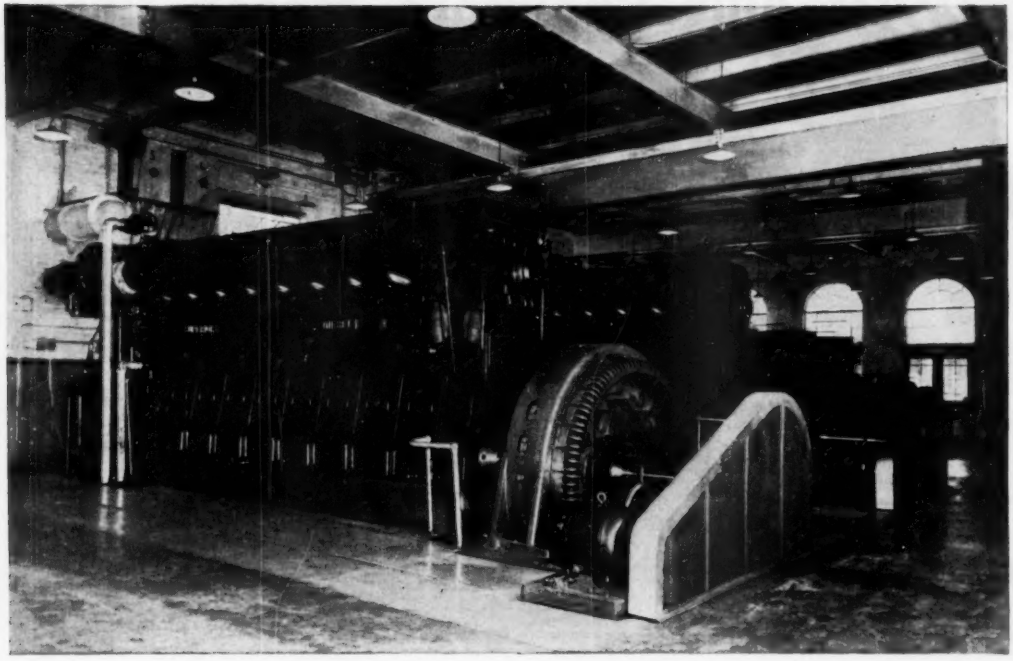

THEY BURNED THE MORTGAGE IN LESS THAN 10 YEARS

● An Arkansas town started a power generating plant over 10 years ago with three Superior Diesels. When they threw the switch on this new venture they had a $49,000 debt. In less than 10 years they burned the mortgage.

Since this municipal power plant started operations, it has paid over $122,000 in power dividends to the city . . . in free street lights, and 80% discounts to schools, churches, and charities. They added another Superior Engine in 1945 . . . still another in 1946 . . . and bought their sixth Superior Diesel in 1949.

In addition to these dividends and necessary capital improvements, operating profits made it possible to repeal a special tax assessment. Today this Arkansas power plant is debt-free and making a substantial annual profit. Its customers get the lowest priced electrical power in the locality.

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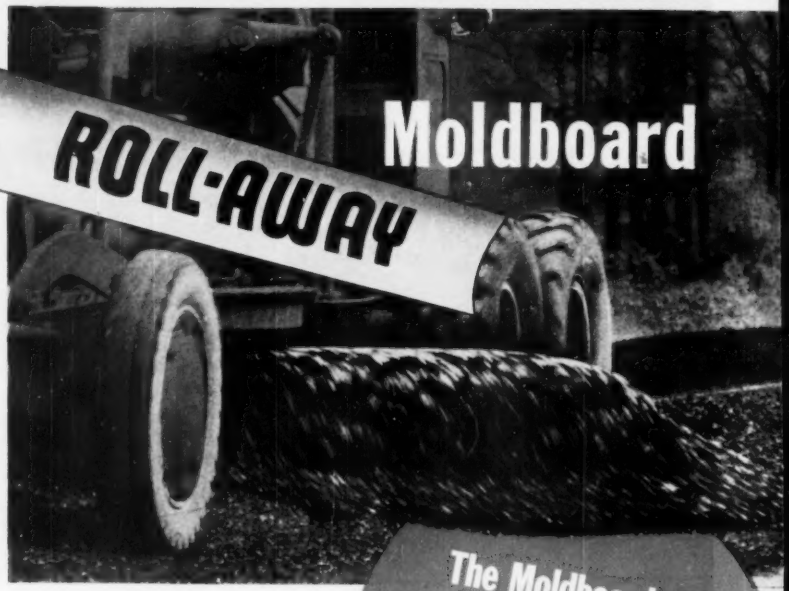
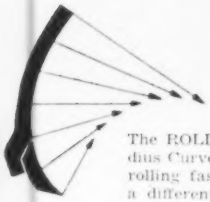
Only Allis-Chalmers Motor Graders

have the ROLL-AWAY Moldboard



More and Better
Work Done with
Less Power Effort



The ROLL-AWAY Moldboard has an Involute or Variable Radius Curve that lifts material up and moves it away in an easy, rolling fashion. Each part of the blade forces material toward a different point instead of a fixed point — prevents packing, power waste and drag on the entire machine. Material moves WITH an Allis-Chalmers Motor Grader — not against it!

The Moldboard That Moves Material the Easiest Way... by Rolling it!

Standard On All Allis-Chalmers Motor Graders

Model	Brake Hp.	Weight
AD-4	104	22,140 lb.
AD-3	78	21,825 lb.
BD-3	78	19,042 lb.
BD-2	50.5	17,772 lb.
D	34.7	8,500 lb.

Ask Your Allis-Chalmers Dealer For a Demonstration . . . NOW!

"Seeing Is Believing"

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I'M THE ANSWER. I'M IN A PACKAGE WITH MY NAME AND SPECIFICATIONS LEGIBLY PRINTED ON THE OUTSIDE FOR QUICK IDENTIFICATION. CUT OFF AS MUCH AS YOU NEED AND THE REST OF ME WILL STAY CLEAN AND REMAIN PROTECTED IN THE STURDY PACKAGE UNTIL YOU WANT MORE FOR THE NEXT USE.

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Good Riddance of Bad Garbage!

Garbage is certainly not one of our nicer words. The job of garbage removal isn't exactly nice either, but it's a municipal problem with which city officials must live every day.

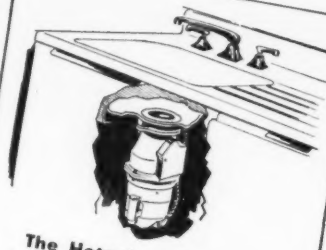
Garbage removal is becoming more and more costly. Furthermore, the old-fashioned "can and wagon" system is still a malodorous, unsightly and dangerously unsanitary method of garbage collection.

The Hotpoint Municipal Plan can make your community "A City Without Garbage" and eliminate the cost of garbage collection from your budget. A complete, factual presentation, based on experience and written specifically for municipal officials, is available for your study. This plan is being presented at the request of many municipal governing bodies through the country, and we shall be glad to present it to you.

Your community will gladly welcome the opportunity to enjoy:

- *A convenient, new and modern garbage removal system.*
- *Health protection to the members of all families.*
- *Fly and rat pest reduction.*
- *Waste collection cost reduction.*
- *More digestion gas for use and sale.*
- *Elimination of food waste before it becomes garbage.*
- *Elimination of alley garbage can.*
- *Elimination of garbage collection problems.*
- *Elimination of garbage odors.*
- *True sanitation for your town.*

And—it saves you money!



The Hotpoint Disposall® is easy to install in any sink . . . convenient . . . safe . . . odorless and economical. Simple to operate . . . keeps kitchens, sinks and hands clean. Does not overload or clog sewer systems.

Hotpoint will gladly make a comprehensive presentation of the Hotpoint Municipal Plan to the interested parties of your city government. Write, wire or phone Hotpoint Disposall Department, 5600 West Taylor Street, Chicago 44, Illinois.

Hotpoint Inc.

(A General Electric Affiliate)

5600 West Taylor Street, Chicago 44, Illinois

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Painted for U. S. Pipe & Foundry Co. by Paul Laune

There's a solid satisfaction in specifying cast iron pipe. You know that your choice coincides with the judgment of leaders of your profession the world over. And when the line is backfilled, you are confident that it will serve throughout a long life at a low annual maintenance cost. This has been true of cast iron pipe for centuries; yet in the fifty-one years since our Company was founded, notable advances in manufacturing methods and controls have been made, resulting in a finer, more uniform pipe. United States Pipe and Foundry Company, General Offices: Burlington, N. J. Plants and Sales Offices Throughout U. S. A.

U.S.
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PIPE
AND INDUSTRIAL SERVICE

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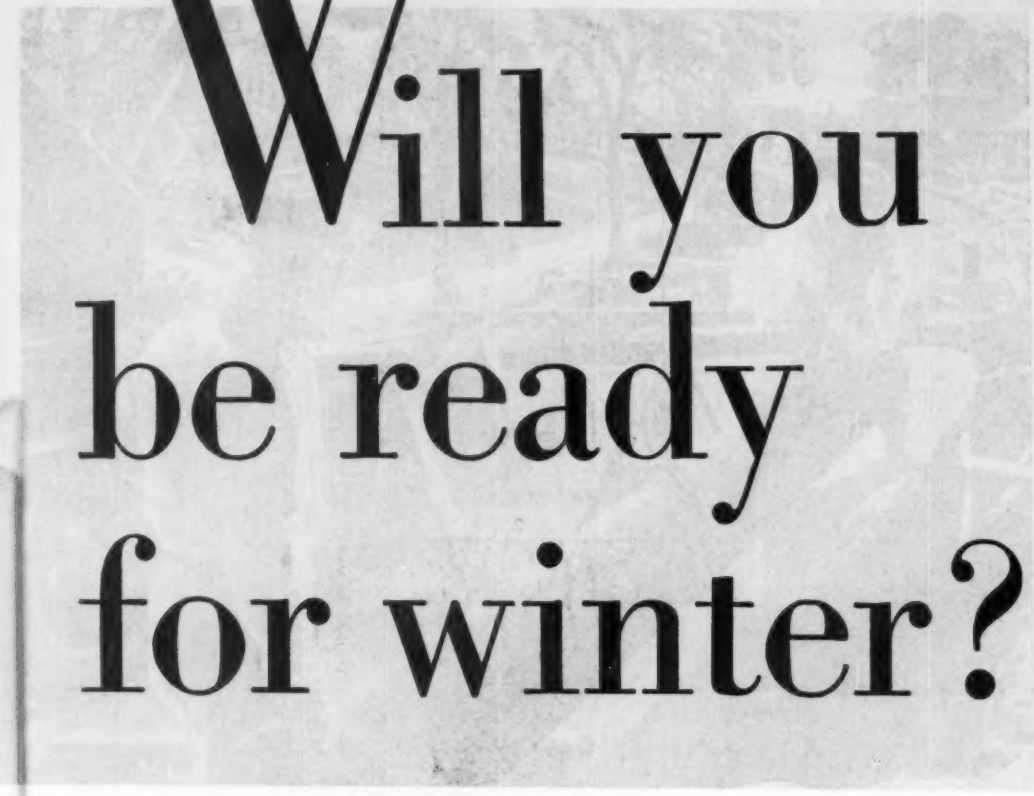
Will you be ready for winter?



UNUSUALLY heavy snows hit many sections of the country last winter. In some localities schools were closed for days or weeks. Drifted roads blocked busses and held up the mails. Outlying homes were caught without food. People froze in stalled cars and others died because they were unable to reach hospitals.

Where "Caterpillar" equipment was on the job, things were better. Read what F. L. Brannan, Superintendent of Schools at Winthrop, Washington, has to say about the work of a "Cat" No. 12 Motor Grader:

"Our unusual winter weather this year, with its extreme cold and heavy snowfall, was a critical problem to our schools. We have the Okanogan County road crews to thank for the resumption of our school bus service. Their large 'Caterpillar' snowplow performed heroic feats in its round-the-clock efforts to clear our many miles of roads. It opened and reopened them day and night."

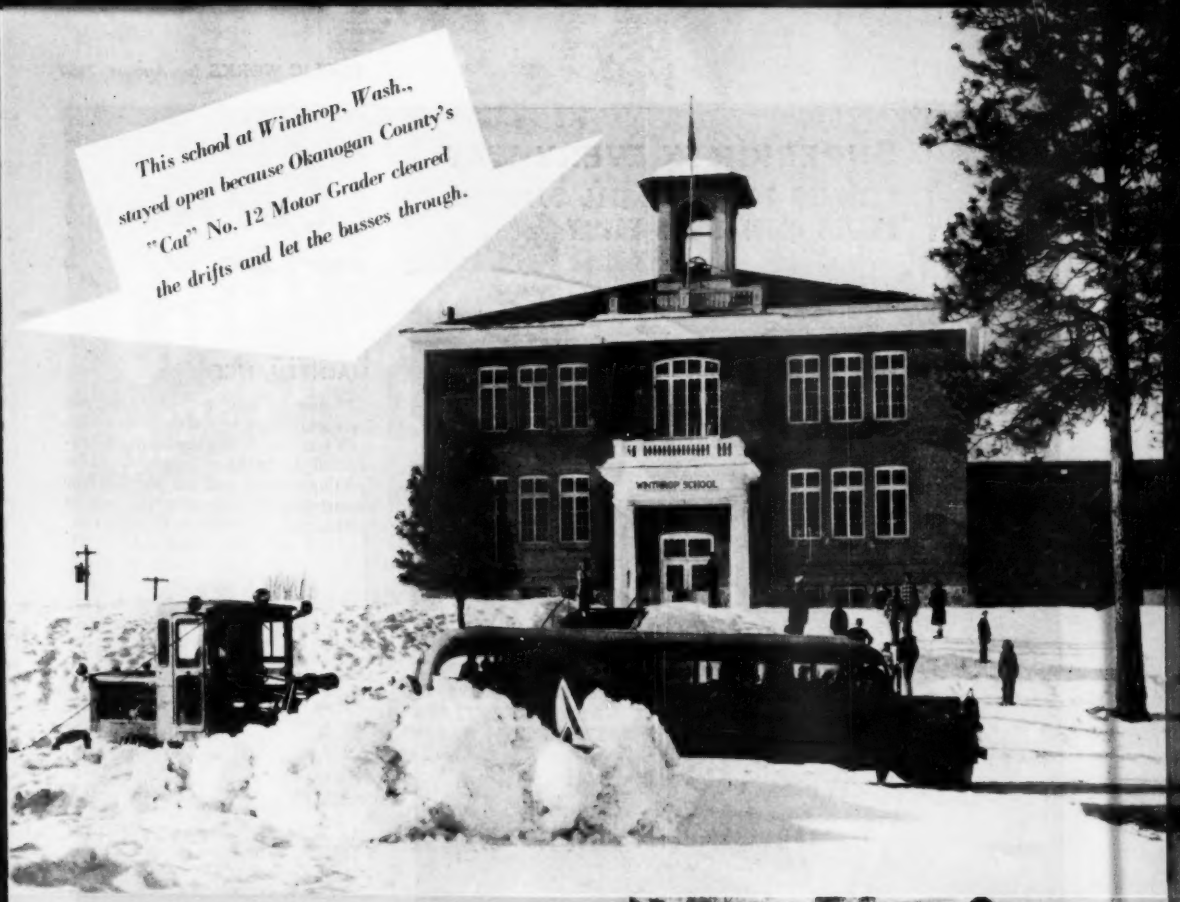
Efficient snow removal is all in the day's work for the big yellow machines built by "Caterpillar." "Cat" Motor Graders, equipped with V-plows and snow-wings; "Caterpillar" track-type Tractors with 'dozers—these are practical snow-fighters that pay their way in year-round work. They don't go into storage when the spring thaws come. All summer they're busy at road maintenance and other jobs. And when snow flies they're ready to tackle the heaviest falls.

Their rugged "Caterpillar" Diesel Engines are built to start fast in the coldest weather and keep going night and day. Every inch of these tough machines is "Caterpillar"-built. That means quality materials, sound engineering and long, economical work life.

An "unusual" winter may cripple your community any year. Your "Caterpillar" dealer is equipped to supply the right machines for your needs, and the service that will keep them in fighting trim. The time to talk to him is *now*.

CATERPILLAR • **PEORIA, ILLINOIS**

This school at Winthrop, Wash., stayed open because Okanogan County's "Cat" No. 12 Motor Grader cleared the drifts and let the busses through.



LOOK UNDER THE HIDE

The advanced design of the "Caterpillar" fuel injection valve offers owners maximum simplicity. Machined to extremely close limits, these valves are made from the finest quality materials —and are subjected to very detailed hardening processes. Valves are completely interchangeable and are adjustment-free. A large single orifice minimizes fouling. With the matched design of valves and precombustion chambers, owners use low-cost, non-premium fuels to get top-notch economy. Look under the hide for the quality that pays off in profit-making operation.

• Equipped with V-plow and snow-wing, this "Cat" No. 12 operated 16 hrs. a day and kept 20 miles of road open in Lincoln Co., Wash. Says the foreman: "No other machine will take a beating like a 'Cat'."

CATERPILLAR

REG. U. S. PAT. OFF.

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SUPERIOR IN EVERY WAY
DESIGNED TO PROVIDE ALL PRACTICAL SHAPES QUICKLY AND EASILY
DOWEL JOINT CURB FORMS •
STRAIGHT, RIGID AND FLEXIBLE RADIUS CURB AND GUTTER FORMS •
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BUILDS IT BETTER
Compare Heltzel forms with any other make . . . the most rigid, the most completely engineered equipment obtainable . . . straight, radius, flexible and serpentine curbs and gutters and sidewalks are formed swiftly and economically with the barest minimum of labor where Heltzel forms are used. Let us send you complete information, including illustrations of the Heltzel line — ASK FOR BULLETIN A-20-G.
SHAPES, STANDARD OR SPECIAL, ARE EASILY MADE FROM HELTZEL STEEL FORMS
HELTZEL
STEEL FORM & IRON CO.
WARREN, OHIO • U. S. A.

When you need special information—consult READERS' SERVICE DEPT. on pages 85-89.

HYDRANT MAINTENANCE

Please advise us whether you have published any articles in which maintenance of fire hydrants is described as being a function of the fire department and not of the water department. Please give us date of publication of such articles.

Max Grossman,
Ass't. Sup't. & Engr.,
Water Department,
Atlantic City, N. J.

(Ed. Note: We have not published any articles on this subject, nor have we been able to find any other recent articles which discuss this matter with any definiteness. If our readers can help, we hope they will write Mr. Grossman, sending us a copy of the letter).

SEWER INSECTS

In your June issue of PUBLIC WORKS, Mr. Leon Gary reports that he believes Houma, La., is the first city to initiate sewer insect extermination. I can report an earlier program in San Tome', Venezuela, S. A. This is a city of 6,000 and is owned by the Mene Grande Oil Co., a subsidiary of Gulf Oil. San Tome' was also the first city in Venezuela to install complete treatment of sewage. The sewage treatment plant was furnished by Chain Belt Co. and is operated under the direction of A. B. McTear and R. McNutt, and is producing enviable results.

Thomas T. Hay,
Sup't. Sewage Disposal,
Racine, Wisc.

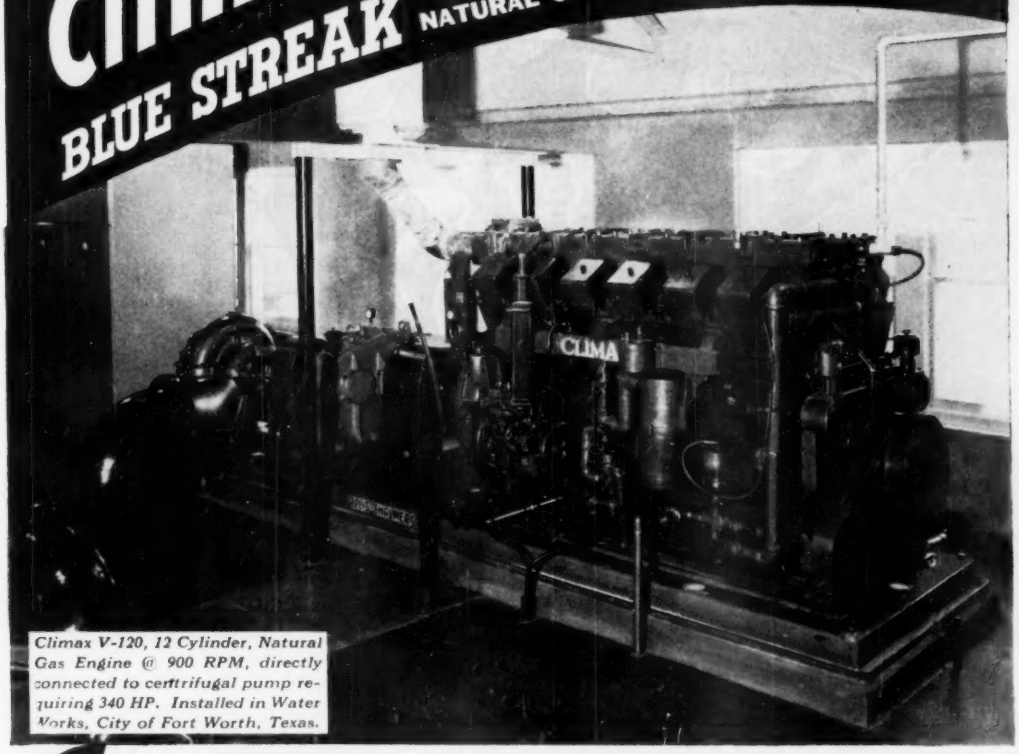
BOOKS IN BRIEF

HIGHWAY DESIGN & CONSTRUCTION

A third, and up-to-the-minute, edition of one of the finest books published on highway design and construction. In addition to describing modern methods of construction, this text places special emphasis on preliminary studies, in-

More on page 20

climax BLUE STREAK GASOLINE NATURAL GAS ENGINES



Climax V-120, 12 Cylinder, Natural Gas Engine @ 900 RPM, directly connected to centrifugal pump requiring 340 HP. Installed in Water Works, City of Fort Worth, Texas.

FOR STANDBY OR CONTINUOUS SERVICE

Four Climax Blue Streak engines are installed in the Fort Worth Water Works for dependable standby service in case of failure of normal power supply. These engines are on the job constantly to protect Fort Worth citizens by maintaining dependable fire protection and lowering insurance rates.

In addition to using these engines for emergency service, this progressive city proposes to operate these engines during peak load periods to supplement the motor driven pumps which would otherwise be overloaded or require additional units.

Climax engines have been selected due to their well known reliability and quick starting features.

Write for complete information and specifications on these dependable power plants. There are 4, 6, 8 and 12 cylinder engines, rated from 40 to 495 HP, operating on sewage, natural gas, Butane or gasoline.

climax ENGINE AND PUMP MFG. CO.

Factory and General Office Clinton, Iowa **(Formerly Climax Engineering Co.)** **Regional Offices** Chicago – Dallas

Without beam strength—or, for that matter—without all of the strength factors listed opposite—no pipe laid 100 years ago in *city streets* would be in service today. But, in spite of the evolution of traffic from horse-drawn vehicles to heavy trucks and buses—and today's vast complexity of subway and underground utility services—cast iron gas and water mains, laid over a century ago, are serving in the streets of more than 30 cities in the United States and Canada. Such service records prove that cast iron pipe combines all the strength factors of long life with ample margins of safety. No pipe that is provably deficient in any of these strength factors should ever be laid in city streets. Cast Iron Pipe Research Association, Thos. F. Wolfe, Engineer, 122 So. Michigan Ave., Chicago 3.

CAST IRON PIPE

When you need special information—consult READERS' SERVICE DEPT. *on pages 85-89*

Strength factors of Long Life !

No pipe that is provably deficient in any of these strength factors should ever be laid in city streets

BEAM STRENGTH

When cast iron pipe is subjected to beam stress caused by soil settlement, or disturbance of soil by other utilities, or resting on an obstruction, tests prove that standard 6-inch cast iron pipe in 10-foot span sustains a load of 15,000 lbs.

CRUSHING STRENGTH

The ability of cast iron pipe to withstand external loads imposed by heavy fill and unusual traffic loads is proved by the Ring Compression Test. Standard 6-inch cast iron pipe withstands a crushing weight of more than 14,000 lbs. per foot.

SHOCK STRENGTH

The toughness of cast iron pipe which enables it to withstand impact and traffic shocks, as well as the hazards in handling, is demonstrated by the Impact Test. While under hydrostatic pressure and the heavy blows from a 50 pound hammer, standard 6-inch cast iron pipe does not crack until the hammer is dropped 6 times *on the same spot* from progressively increased heights of 6 inches.

BURSTING STRENGTH

In full length bursting tests standard 6-inch cast iron pipe withstands more than 2500 lbs. per square inch internal hydrostatic pressure, which proves ample ability to resist water-hammer or unusual working pressures.

SERVES FOR CENTURIES

Having SLIDE RULE trouble?

When the problem is moving air or gas, turn to *R-C dual-ability* for accurate, dependable answers

That's one job we know, inside-out. For almost a century, we've been air-and-gas specialists, exclusively. Without being immodest, we think our engineers are the best informed in the industry, on blowers, exhausters, gas pumps and related equipment.

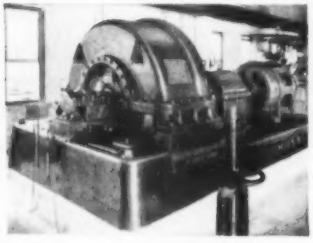
They have an extensive line to draw on, too. They make unbiased recommendations between Centrifugals and Rotary Positives—we're the only company offering this *dual choice*. With capacities ranging from 5 cfm to 100,000 cfm, we can supply standard units closely matched to the job, for efficiency and economy.

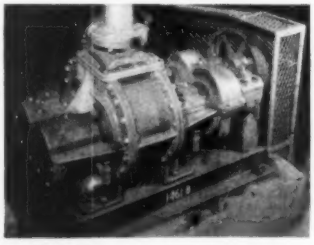
As to how R-C equipment performs, our old-time, repeat customers are the best answer to that. They'll testify that you will reduce your buying and operating problems when you call on R-C air-and-gas specialists.

ROOTS-CONNERSVILLE BLOWER CORPORATION
508 Poplar Avenue, Connersville, Indiana

CENTRIFUGAL

2-stage Centrifugal Blower with capacity of 13,500 cfm, in sewage treatment plant.





ROTARY

Rotary Positive Blower used in water treatment process. Capacity 300 cfm.

ROOTS-CONNERSVILLE

BLOWER BUILDERS SINCE 1854

ONE OF THE DRESSER INDUSTRIES

When you need special information—consult READERS' SERVICE DEPT. on pages 85-89.

(*Continued from page* 16)

cluding planning surveys; highway classification; vehicle characteristics; driver behavior; sight distance; preliminary location studies; origin and destination studies; traffic data; intersection study and treatment; highway capacity; and speed characteristics. Both authors are with the Bureau of Public Roads. By Arthur G. Bruce and John Clarkeson. International Textbook Co. $7.25.

RAINFALL & RUNOFF

This is a new book by E. E. Foster of the Bureau of Reclamation. We have not seen a copy and this note is based on the literature issued by the publisher. This says that the book is "the first complete guide to modern methods of estimating, measuring and analyzing the distribution, volume and flow of water from all sources." There are 487 pages and 179 figures and illustrations. $9 from Macmillan Co., New York 11, N. Y.

MUNICIPAL & RURAL SANITATION

This is a new fourth edition of an old favorite—Municipal and Rural Sanitation by Ehlers & Steel. It covers environmental sanitation problems from blue babies to DDT, and from diatomite water filters through sewage disposal—plus a host of other topics. There is little to say about this book for its predecessor editions established its value, and this is merely and up-to-date broadening of the former editions. 525 pages; 147 illustrations; McGraw Hill Book Co. $6.50.

ENGINEERING ECONOMY

Here is a book that every engineer ought to study. The first two chapters are: "Hunch" Decisions Are Dangerous; and Business Decisions are Between Alternatives. There is a lot of good sense in them on how to make up your mind. Part II covers the time element in economy; Part III presents techniques for economy studies; and Part IV tells how to get results from economy studies. This is the third edition and the author tells us that two-thirds of the original text has been rewritten. Written by Eugene L. Grant of Stanford University, this book contains 623 pages, is published by Ronald Press and sells for $5.

Which filter pioneered continuous mechanical sludge dewatering, making the elimination of sludge beds practical and economical?

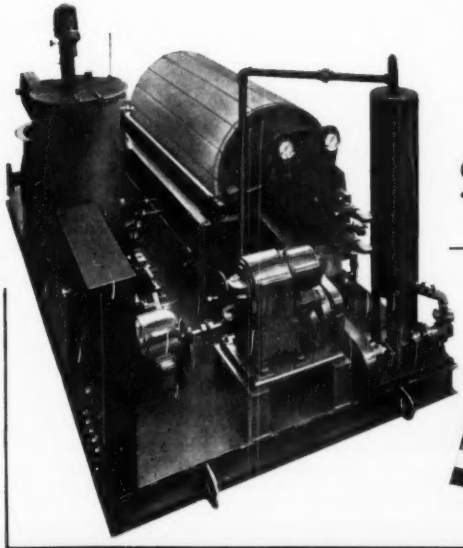
Which filter carried mechanical sludge dewatering through the inevitable "trial and error" period to its present high state of adaptability and effectiveness?

Which filter *today* can show the greatest amount of installed filter area?

Which filter can show the greatest amount of varied filtration experience including industrial waste handling?

Which filter has the most experienced engineering staff back of it, experienced in the field of continuous sludge dewatering?

It's the Oliver Filter . . . the sure bet for any city or town wanting a seasoned, well-experienced filter for dewatering its sewage sludges.



OLIVER SLUDGE DEWATERER

Send for Bulletin No. 219 which gives details of the Oliver Mechanical Sludge Dewaterer. Small communities particularly will be interested in the "Packaged" Oliver Filter, such as illustrated.

OLIVER UNITED FILTERS INC.

UF INC.

New York — 33 W. 42nd St.
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"Hey, Joe! Did you ever see a $100 bolt?"

JOE: "What d'ya mean, a hundred-dollar bolt?"

GUS: "Just what I said. We're raising Number 3 Gate just now and this anchor bolt let go."

JOE: "But we put that gate in less than two years ago, and..."

GUS: "Yeah, I know. But we used ordinary bolts and this one's already rusted through. It'll cost at least a hundred bucks to take that gate out, dig the old bolt out of the concrete and set a new one in."

JOE: "I guess it will. But from here out we don't make that mistake twice. From now on everything that goes in is Everdur."

Most sewage and waterworks engineers have discovered that the most economical way to lick the corrosion problem in their plants is to use Everdur*—ANACONDA's copper-silicon group of alloys. There are plants where equipment made of Everdur has been doing it for over 22 years.

If you don't already know about Everdur, let us tell you about its high strength, durability and how easy it is to fabricate it into lightweight, low-cost wrought assemblies. Just ask for the Everdur booklets. Let our Technical Department counsel you on any special problems or applications. Write to The American Brass Company, Waterbury 88, Connecticut. In Canada: Anaconda American Brass Ltd., New Toronto, Ontario.

49170

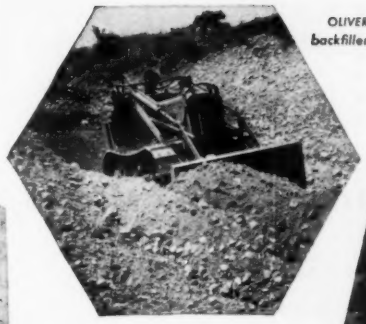
Where corrosion resistance counts—use Everdur

ANACONDA copper-silicon alloys

*Reg. U. S. Pat. Off.

When you need special information—consult READERS' SERVICE DEPT. on pages 85-89.

OLIVER HG Crawler Tractor with Ware Loader loading sand into truck.



OLIVER HG Crawler Tractor with Ware backfiller blade attached to shovel arms.

OLIVER Model "88" Wheel Tractor with Ware Boom handling cast iron pipe.

...take the "Load" out of Your Loading Problems!

Whatever your loading problem, the easy, economical answer is an Oliver Crawler Tractor or Oliver Industrial Wheel Tractor and Ware Front-End Loader.

These powerful tractors and the hydraulically operated loaders are easy to operate . . . easy on maintenance and operating costs. Lift and bucket are hydraulically controlled. Hydraulic control of bucket assures greater breaking-out action and full loads . . . prevents wasteful spillage. "Midsection" pivot allows longer reach of dumping position and distributes the weight advantageously over the tractor frame to minimize strain. The hydraulic rams are designed to take most of the shock loads, assuring longer life for both tractor and loader.

And, the tractor-loader unit can be quickly converted to backfiller, boom or lifting fork. Special buckets are available for coal, snow or humus loading. The hydraulic system can be used to power other equipment such as mowers, sweepers, etc., in combination with the loader. For all the facts, see your local Oliver Industrial Distributor, or write direct to:

OLIVER Model "88" Wheel Tractor and Ware Loader loading out gravel.

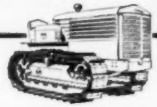
OLIVER HG Crawler Tractor with Ware Loader on ditching job.

THE OLIVER CORPORATION

Industrial Division: 19300 Euclid Avenue, Cleveland 17, Ohio

A complete line of Industrial Wheel and Crawler Tractors

"THE SIGN OF EXTRA SERVICE"



TODAY'S FILTER PLANTS : *use vitrified clay filter bottom blocks*

in Reconditioning Old Filters

PLACE: **FORT WORTH, TEXAS**

ENGINEERS: **FREESE AND NICHOLS**

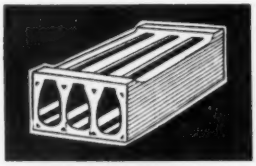
Reconditioning old filter at Fort Worth, Texas, with new floor of Vitrified Clay Filter Bottom Blocks

In addition to its proposed 8 new filters of 200' diameter, Fort Worth is completely reconditioning its old filter. Old stone has been taken out and a floor of *Vitrified Clay Filter Bottom Blocks* laid.

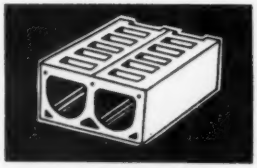
These scientifically designed blocks are being specified by leading consulting engineers everywhere to insure best operating results from trickling filters. In the picture above the blocks have been laid on dry mortar and hosed down after set in place.

They are self-aligning and, large top openings provide proper drainage and ventilation at all times. Solids don't cling to the smooth channel walls. They resist all acids normally found in sewage. They come with standard fittings for all types and shapes of filters . . . and anybody can lay them.

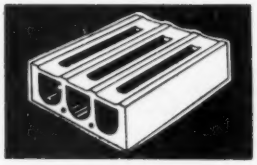
Floors like that pictured above give life-time, trouble-free service. Specify these *Vitrified Clay Filter Bottom Blocks* whenever you design new filters or recondition old ones. For engineering data and prices, write any member of this Institute today.



Natco

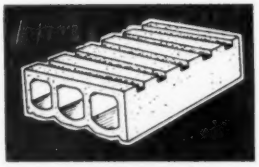


Bosco

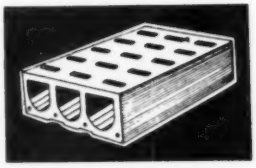


Pomona

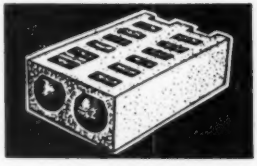
Special Features:
WON'T CLOG
RESIST ACIDS
PROVED BY USE
EASY TO LAY



Translot



Dickey



Armcro

TRICKLING FILTER FLOOR INSTITUTE

NATIONAL FIREPROOFING CORP. Pittsburgh 12, Pa.
BOWERSTON SHALE CO. Bowerston, Ohio
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When you need special information—consult READERS' SERVICE DEPT. on pages 85-89.

PROVED *in every service*

In fire and police service; in the rough and rugged going of forestry, and construction work; along oil, and gas pipe lines; on the highways and in jangling city traffic . . . Raytheon Radiophone has proved its remarkable dependability and adaptability. For ease of installation, for simplicity and economy of operation, for clarity of reception and freedom from adjacent channel interference, Raytheon Radiophone provides the finest in mobile and fixed station equipment. Write today for complete information. Use the coupon below.

NEW MODEL UM 30 MOBILE UNIT

- Available in both single and dual channel models covering the entire 152-174 mc. frequency range.
- Requires less space — easier to install.
- Lowest battery drain — no special batteries or generators required.
- Meets all new F. C. C. requirements including adjacent channel operation and modulation limiting (deviation control).
- Furnished complete with all accessories.

COMPLETE BASE STATION EQUIPMENT

- Complete transmitting-receiving equipment for 30 or 60 watt base station systems.
- Designed throughout for maximum convenience, efficiency, ease of operation and simplified maintenance.

Model US 60-1-LC control console (shown above) contains every desirable feature of a fixed station control unit. Equipment for wall or rack mounting also available.

RAYTHEON

Excellence in Electronics

RAYTHEON
MANUFACTURING COMPANY
WALTHAM, MASSACHUSETTS

Sold Exclusively in Canada by Canadian Marconi Co., Marconi Bldg., St. Sacrament St., Montreal

Export Sales and Service: Raytheon International, 50 Broadway, New York 4, N. Y.

MAIL THIS COUPON TODAY!

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Raytheon Manufacturing Co.
Waltham 54, Massachusetts

Please send complete information on Raytheon Mobile Radiophone:
Model UM 30 (30 watt) Mobile Unit
Model US 30 (30 watt) Base Station Equipment
Model US 60 (60 watt) Base Station Equipment

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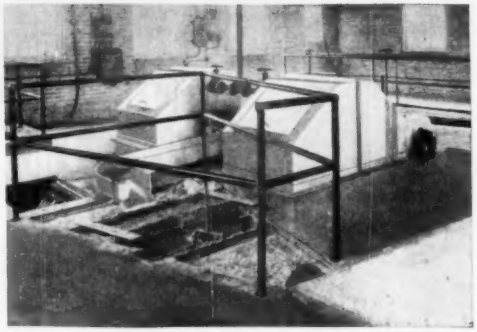
ORGANIZATION .....
ADDRESS .....
CITY .....ZONE.....STATE.....

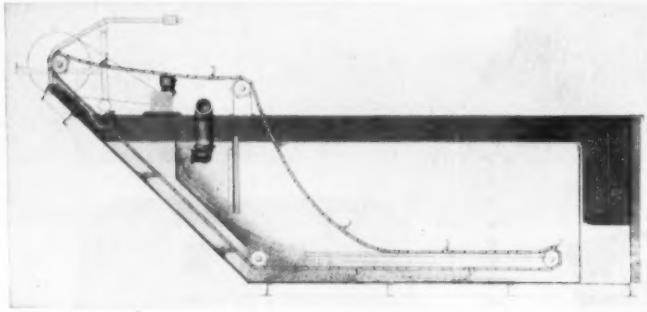
When writing, we will appreciate your mentioning PUBLIC WORKS

Let Link-Belt Help You Dispose of *Industrial Wastes*

Safeguard public health or salvage valuable by-products from waste water, or perhaps do both, by means of Link-Belt equipment for water, sewage and industrial waste treatment. Note the four typical applications here shown.

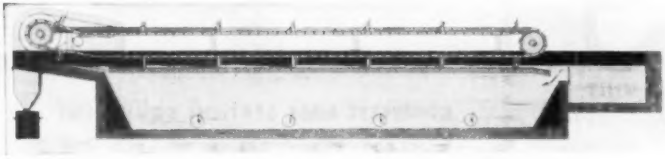
Link-Belt engineers, with a broad line of equipment and extensive experience, can aid you in planning and installing the right type of plant to solve your specific waste problems.





Above: Waste recovery system at large glue factory, consisting of enclosed revolving screens with settling pit and dewatering screw conveyor for the screenings.

Left: Coolant clarifying system utilizing Link-Belt dewatering conveyor. After clarification, coolant may be filtered or returned direct to grinding machines.



Left: Paper stock is recovered in the Link-Belt Save-All by a mechanical skimmer which collects the floating stock with a minimum of water.

Left: Heavy grit and detritus is removed from flume water at sugar beet factories, by settling in a tank equipped with a Link-Belt grit collector.

The Link-Belt line includes screens, sludge collectors, grit collectors, grit washers, chemical mixers, sludge dryers, power transmitting, elevating and conveying machinery.

LINK-BELT COMPANY

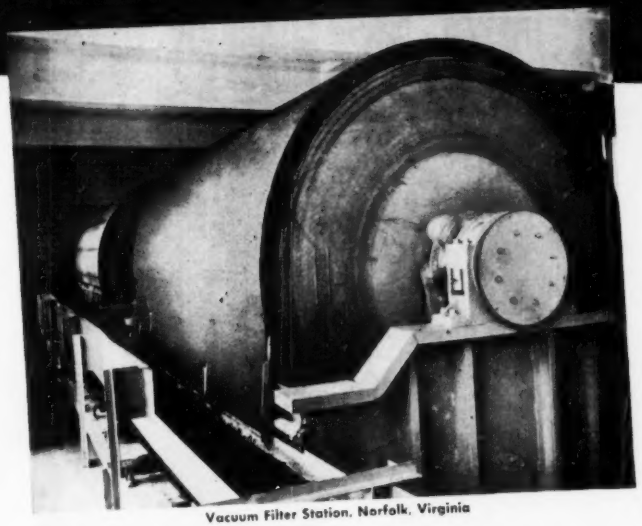
Philadelphia 40, Chicago 9, Indianapolis 6, Atlanta, Houston 1, Minneapolis 5, San Francisco 24, Los Angeles 33, Seattle 4, Toronto 8. Offices in Principal Cities.

11,813

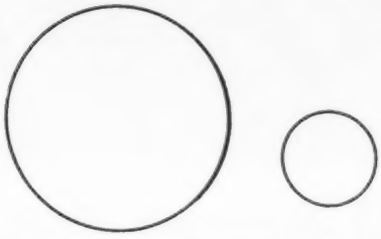
LINK-BELT

Sanitary Engineering Equipment

When you need special information—consult READERS' SERVICE DEPT. on pages 85-89.

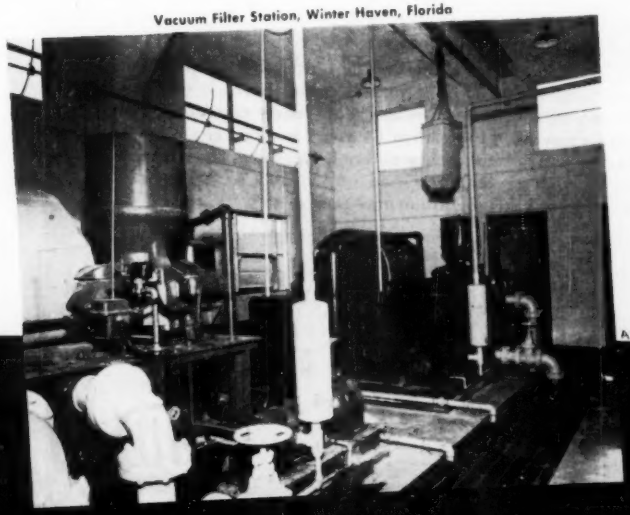


Vacuum Filter Station, Norfolk, Virginia



Reduce the size of your digestors by eliminating the need for long storage periods through the use of vacuum filtration.

Vacuum Filter Station, Winter Haven, Florida



Design Sewage Treatment Plants for Line Production At Lower Cost

Many new sewage treatment plants on the drawing boards and under construction will use vacuum dewatering of sewage sludge because modern sanitation requires the advantages of this modern equipment.

Consulting engineers know that long trunk lines are expensive when run a distance out of the community. Modern sanitary equipment eliminates this needless expense.

Many other advantages are available only with Eimco continuous vacuum sludge dewatering, such as:

Smaller space required; smaller storage tanks or digesters, more sanitary conditions; elimination of insect breeding places; and low first cost.

Let an Eimco engineer help you solve your sludge dewatering problems — you'll save on the total initial investment.

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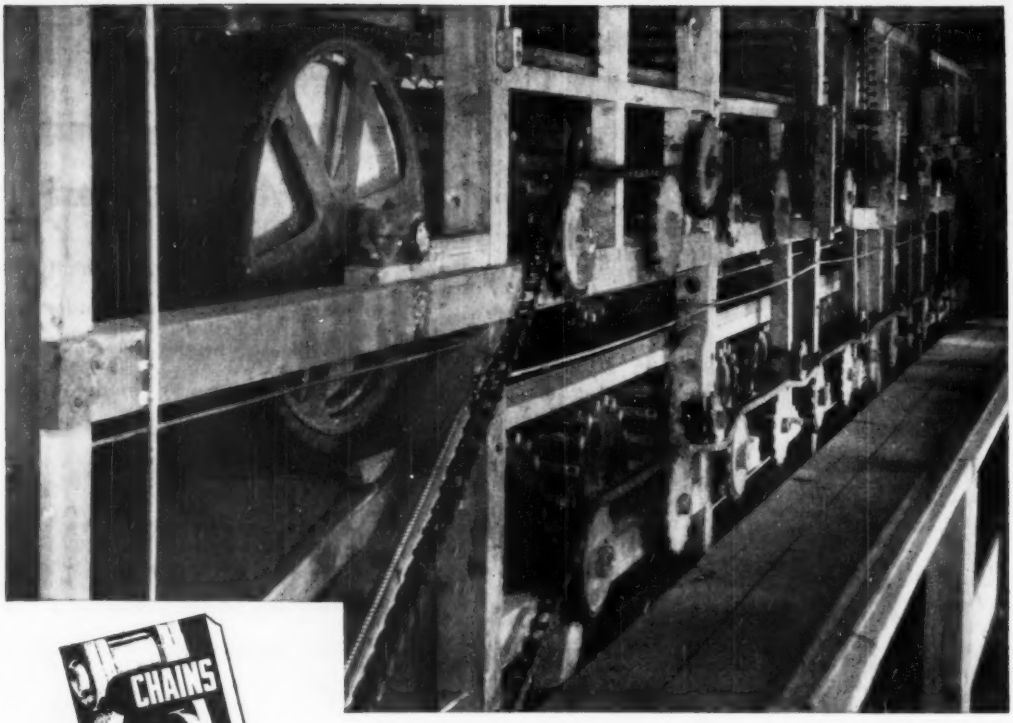

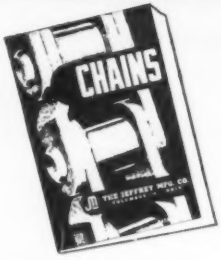

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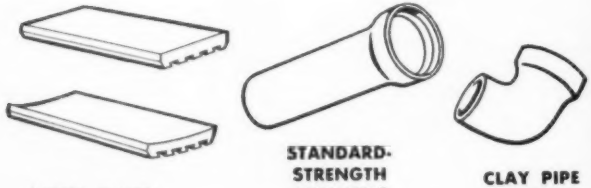

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PUBLIC WORKS MAGAZINE

AUGUST, 1950
VOL. 81, NO. 8

Courtesy Carroll, Grisdale & Van Alen

● *THIS architect's sketch shows how Philadelphia's new airport will look from the air.*

Philadelphia AIRPORT to HANDLE PASSENGERS BETTER

NORMAN SHIGON

A SET of "fingers" on Philadelphia's new airport terminal building, now under construction, will take much of the awkwardness and discomfort out of passenger handling at the airport. The "fingers" are the passenger ramps that will extend out from the main section of the terminal. There will be two "fingers", providing berths for 17 planes; and additional "fingers" can be added as increase in traffic warrants.

The terminal building is one of the first airport structures in the world which will permit passengers to board planes without being exposed to the elements. Passengers will be taken to the second floor by an escalator. They will then proceed along a corridor until they come to a loading ramp marked with the number of the flight. An all-metal 40-foot long gangplank will be swung out and connected with the hatch of the plane. Passengers will thus be able to enter a plane without having to climb any steps.

The new terminal building will house shops with merchandise from all parts of the world; it will have a branch office of a bank; sleeping quarters for passengers between flight; beauty salons; barber shops; and a large restaurant and bar. It will be three stories in height with its entire north wall of glass. On the south side of the building and toward the air field the windows generally will be larger for the sake of the view, and these windows will be double glazed, and also will be furnished with aluminum sun shades throughout the entire length.

The ground floor will also contain postal facilities, a cafeteria for employees, an operations office and a baggage pick-up. Because all passenger movement within the building and to the plane berth itself is on the second level, all other services and vehicular traffic both for baggage and for airplane servicing can be carried on simultaneously on the field level. The "fingers", for example, are designed so that they are entirely open at the field level and permit free passage of baggage carts and other service vehicular traffic.

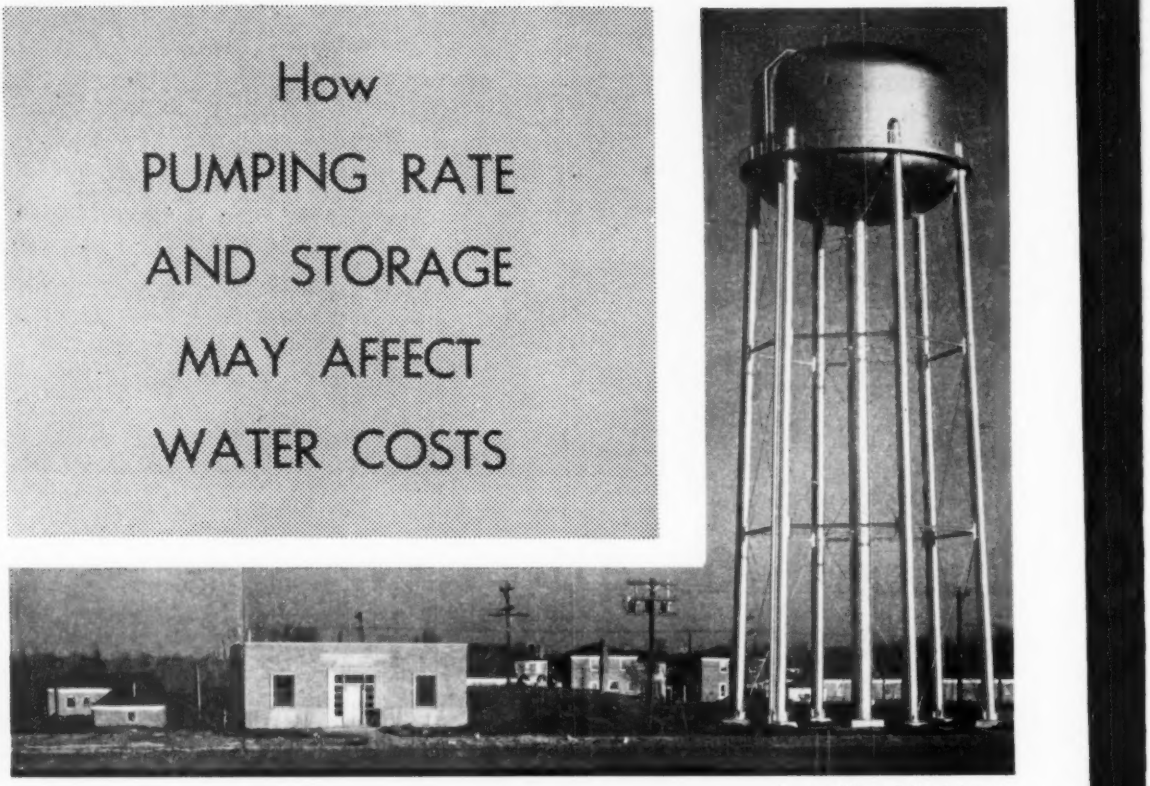
Anticipating that overseas service from Philadelphia will increase with the years, space for the international units is provided on the second floor. Here will be housed the United States Customs, Public Health and Immigration offices.

There will be several escalators, so passengers will have to do very little walking. Also, there will be an observation deck, reached by an outside ramp from the parking lot in the rear of the building. Visitors, according to present plans, will pay 10¢ for admission to the deck.

As far as seems advisable and to prevent congestion, means are provided to keep visitors and sightseers away from the parts of the building used mainly by passengers. For example, an outside ramp leads from the parking area, which is located west of the entrance circle, directly to the third level observation deck and this will permit handling large crowds entirely separate from all passenger areas.

The terminal building is being designed as a fireproof, reinforced concrete structure. Exterior facing materials such as brick and aluminum are being used for economy of first cost and to minimize maintenance. The interior, as far as flexibility will permit, will employ similarly durable materials. Air conditioning is being provided in the main entrance lobby and generally on the second and third floor levels including the restaurant and bar areas, waiting rooms and offices. Control Tower and Weather, and it is available to all concession spaces.

How PUMPING RATE AND STORAGE MAY AFFECT WATER COSTS



Courtesy Chicago Bridge & Iron Co.

JOHN HOWARD DAWSON

Associate Professor, Oklahoma Institute of Technology

MANY factors must be given consideration when selecting pumps for a water works installation. For the purposes of this article, emphasis will be placed upon the pumping requirements for a municipal water supply system. The same considerations, however, are fundamental when using centrifugal pumps for any other service, whether for sewage, in oil field work, or for drainage or irrigation. The major factors to be considered may be classed under four main heads.

Using the estimated population and the demand per capita in this and similar communities, the amount and rate of use of the water to be pumped may be estimated. It is desirable to have the maximum information on these factors. If water service is already provided, specific data should be available.

The water demand requirements should be studied and a plot made of the rate at which water is pumped as compared to the rate at which it is used. This may be plotted as a graph, showing quarter hour or half hour increments. Care should be taken to prepare curves for each of the seasons and for the different days of the week.

The requirements of the National Board of Fire Underwriters will indicate the amount of storage required for fire protection. This is usually a very important item since the insurance rates largely depend upon such factors. A sizeable expenditure to provide adequate pumping and storage facilities may pay for itself over a five year period through reduced insurance rates.

Present System and Possible Extensions

A map should be drawn to show the location, size and type of each pipe. All valves should be located and it should be assured they are wide open. Where records are vague, it may be advisable to test the delivery of flow by opening fire hydrants and checking the flow.

Leaks and breaks in the system should be located and repaired. This is especially important in all suction lines, since air leaks in such lines will greatly reduce the discharge of the pumps.

The manufacturer should be asked for an accurate head-discharge-efficiency curve for each of the pumps in use or to be installed. If the pumps are already in service, the diameter of the impeller should be measured to insure getting the proper curve. This information is not given on the pump nameplate; moreover, the impeller may have been changed.

Care must be taken to make sure that any fire demand can be met, even if one of the pumps is under

This article is based on a paper which Prof. Dawson presented at the meeting of the Oklahoma Water and Sewage Conference, but the data contained in it have been materially modified from the original.—The Editors.

repair. This requires at least two pumps, either of which can carry the entire demand; or, preferably, three or more pumps of various sizes. At least one pump may be connected to a gasoline or diesel engine to make it available for use if electric power fails.

An elevated tank or suitable high-level storage will greatly increase the efficiency of a water system. The size of the tank should be checked and a tell-tale system installed to show at all times how much water is in the tank.

Factors in the Source of Supply

The wells, stream or lake used as a source of supply may be adequate for all needs under all conditions. However, in the southwest, (and also in other areas) water is scarce and it is often necessary to do everything possible to increase and conserve the supply. This may be a main governing factor, since more water may be obtained by pumping continuously from a well at a low rate than by pumping intermittently at a higher rate.

In the case of some wells, it is advisable to maintain a constant drawdown to prevent slugs of colored or bad-tasting water. When the well is being pumped heavily, the water level may drop as much as 200 ft. This allows air to come in contact with and oxidize minerals in the water bearing strata. When the pump is stopped, the water rises and washes off these oxidized minerals; and when the pump is started again they are discharged into the water system. If the well is pumped continuously this is not likely to occur. The water may still have a taste, but at least it is the same in the morning as in the afternoon and the users will be more or less accustomed to it.

Cost and Source of Power

A study should be made of the costs for pumping by electricity and by diesel or gas engines. Most water works pumps are driven by electric motors and use purchased power. Thus most water and sewage plants must pay for the amount of electricity actually used, plus a penalty or extra amount for an unfavorable power factor and a large extra amount for demand current. By using off-peak power and a small demand, it may be possible to handle the same amount of water at a lesser cost, sometimes at one-fourth the cost.

Where new or larger motors are being installed, the power company should be asked to check all the wiring, transformers and other electrical equipment to determine that they are suitable and efficient for the load.

Saving Money on Pumping

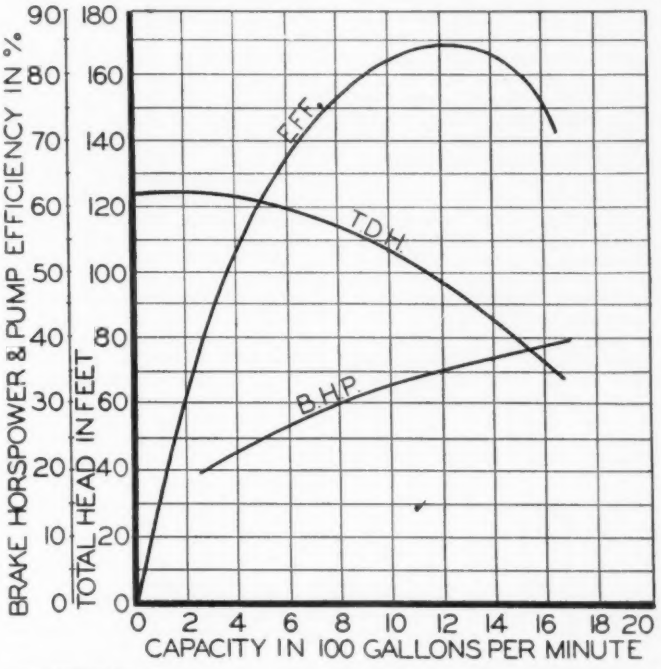
With the data available from the four steps listed above, the superintendent can proceed to figure out the most economical way to operate his system. In order to illustrate one way this problem may be attacked, the demand curve of water use for an average day is drawn up. The accompanying chart shows a sample demand curve. The actual use of water is shown by the curved solid line. The dotted square-edged line has been drawn in to approximate the actual demand and simplify the calculations. (See page 34)

It is assumed that a centrifugal pump will be used to pump the water directly into the system, no elevated storage being provided. The accompanying diagram shows the head, horsepower and efficiency discharge curve for the particular pump used. For sample calculations, assume that power is being purchased at 3 cents per kilowatt hour. For simplicity, the efficiency of the motor will be assumed as 100%.

From 11pm to 7am, a period of 8 hours, there will be a flow of 250 gpm. Referring to the pump curve, the discharge head will be 124 ft.; the efficiency of the pump will be 38% and 20 hp will be required for operation. This is equivalent to 27 kilowatts (20 x 1.341) or a total of 216 kwh required in 8 hours to pump 120,000 gals. (250 x 60 x 8 = 120,000). If electricity costs 3¢ per kwh, this water will cost a total of 216 x .03 = $6.48 or 81¢ per hour. This cost of 81¢ per hour for 250 gpm equals a net cost of 32.4¢ per 100 gpm.

In comparison, we will compute the cost per 100 gpm at a more efficient pumping rate—1500 gpm, which is the rate required for the 3-hour period 7am to 10am. Again referring to the curve, the efficiency of the pump will be 80%; the power required will be 38 hp or 51 kw, and 153 kwh will be required for the three hours pumping. This will cost $4.59 at 3¢ per kwh; and the cost per 100 gpm pumped will be only 10.2¢ or about one-third the cost at the lower pumping rate.

For the 9-hour period from 10am to 7pm, the demand is 1,000 gpm. At this rate, the pump will operate


BRAKE HORSEPOWER & PUMP EFFICIENCY IN %
TOTAL HEAD IN FEET
EFF.
TDH
B.HP
0 2 4 6 8 10 12 14 16 18 20
CAPACITY IN 100 GALLONS PER MINUTE

● ***TYPICAL pump curves, showing efficiency, total dynamic head and brake horsepower required for various rates and heads.***

at 82% efficiency and will require 33 hp, which is 44.4 kw and will cost $1.33 per hour or 13.3¢ per 100 gpm. In the same way, the 400 gpm demand for the 7pm to 11pm period will be found to cost 23.1¢ per 100 gpm.

Adding together these costs, it will be found that the cost for running the pumps 24 hours a day will amount to $26.76, and the cost of pumping 100 gpm will vary from 10.2¢ to 32.4¢. The total water pumped amounts to 1,026,000 gals.

We can now calculate the cost per day of pumping the same amount of water if an elevated water tank is placed in the system, with sufficient storage to care for usual fluctuations in demand so that the pumps can be operated at their most efficient rate; and also so that they can be operated at off-peak periods thereby getting the benefit of a lower power rate. The elevated storage will be assumed at 500,000 gallons. This is easily computed by adding or subtracting the excess or deficiency of the pumping rate and the use rate for each hour. For instance, assuming the tank empty at 11pm, the pump operating at 1,200 gpm from 11pm to 12, and consumption at the rate of 250 gpm for the same periods. The tank would contain 72,000 — 15,000 = 57,000 gals. at midnight.

By arrangements with the power company, a special timed meter can be installed which will supply off-peak power at a lower rate which will be assumed here as 1¢ per kwh. If necessary, power may be drawn at peak periods through the regular water. Such arrangements are common, as in homes using electricity for hot water heating.

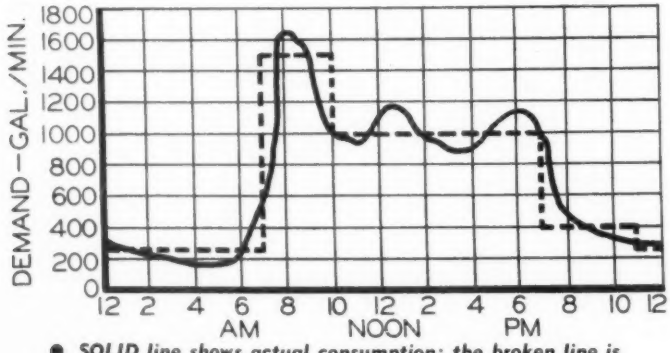
Water will now be pumped into the system at the rate of 1,200 gpm from 11pm to 8am and from 12:30pm to 6pm: a total of 14.5 hours. These periods are usually "off-peak" for electrical demand. The cost of pumping under these conditions will be as follows, the pump having an efficiency of 85% at this rate of operation: Hp required 35, or 47 kw, which for 14.5 hours is 682 kwh. At 1¢ per kwh, the total cost of pumping will be $6.82 per day. This represents a saving of $19.94 over the former method of pumping and shows what economies can be obtained by storage, the use of pumps at their most effective capacities and utilization of off-peak power rates. At the rate of 1,200 gpm, 14.5 hours of pumping will produce slightly more than the 1,026,000 gallons required.

The fact that the pumping station is operated only 14.5 hours a day, instead of 24 hours, may permit a further saving in salaries.

When the demand for water is less than the amount shown on the demand curve, the pumps can be cut off sooner. When the demand is greater, it may be necessary to run the pump for extra hours, using the regular electrical meter and at the regular rate.

In most water supply and sewage pumping problems, two or more pumps should be used. The procedures outlined in this article are applicable to any pumping installation, for one or several pumps. The provision of adequate storage, the operation of pumps at their most efficient ratings, and the use of off-peak electrical rates will, in the great majority of cases, prove markedly economical.

The information on which this material is based was made available by the Worthington Pump and Machinery Corporation. Specific information regarding the most suitable pump may be obtained from any reputable pump manufacturer or dealer; and information on storage facilities from manufacturers of elevated tanks and standpipes.



● ***SOLID line shows actual consumption; the broken line is the consumption assumed for the purpose of computation.***

Water Department Uses Radiotelephone

In order to give better service and to expedite repair work in emergencies, the Little Rock, Ark., Water Department operates a short-wave radio-telephone system. Central radio stations are installed at the business office, at the filtration plant and at Lake Winona. Twelve department cars and trucks are equipped with twoway radio-telephone sets. All of these units operate on the same wave length and consequently expedite repair work and provide instant service in case of emergency.

Elevated Tanks Improve Water System Pressures

ADDITION of a 2-million gallon elevated tank, giving a total elevated storage in three tanks of 3.3 million gallons, has insured ample gravity flow to all parts of the Decatur, Ala., water distribution system. The newest tank, completed last fall, is a radial-cone structure, 90 ft. to the bottom, supported on 16 cylindrical columns 54 ins. in diameter, with a 120-inch central riser. The tank proper is 102 ft. in diameter and has a range of 35 ft. between upper and lower water levels. This tank, constructed by Chicago Bridge & Iron Co., replaced an old standpipe, which was dismantled.

The water treatment plant, drawing water from the Tennessee River, includes rapid and slow mixing of chemicals, rapid sand filters and chlorination. Capacity is 8 mgd., the plant having recently been largely increased in size. Pumping equipment consists of five low-lift units with a total capacity of 24 mgd; four high-lift units with a total capacity of 16 mgd; and two standby pumps of 6 mgd total capacity. All of the pumps are electrically driven and manually controlled. The filtered water is pumped into the distribution system at a pressure of 60 to 65 pounds, and the elevated tanks maintain the pressure at 55 to 60 pounds.

The distribution system has a total of about 400,000 ft. of pipe, 2-inch to 24-inch; and, in addition, there are about 40,000 ft. of 12-inch to 24-inch transmission lines. Water usage ranges from 3 to 4 mgd.

George Godwin is Manager of the Decatur Water Department. Consulting engineers on the recent improvement were Polglaze & Basenberg of Birmingham.

POST WAR

PREVENTIVE MAINTENANCE of STREETS

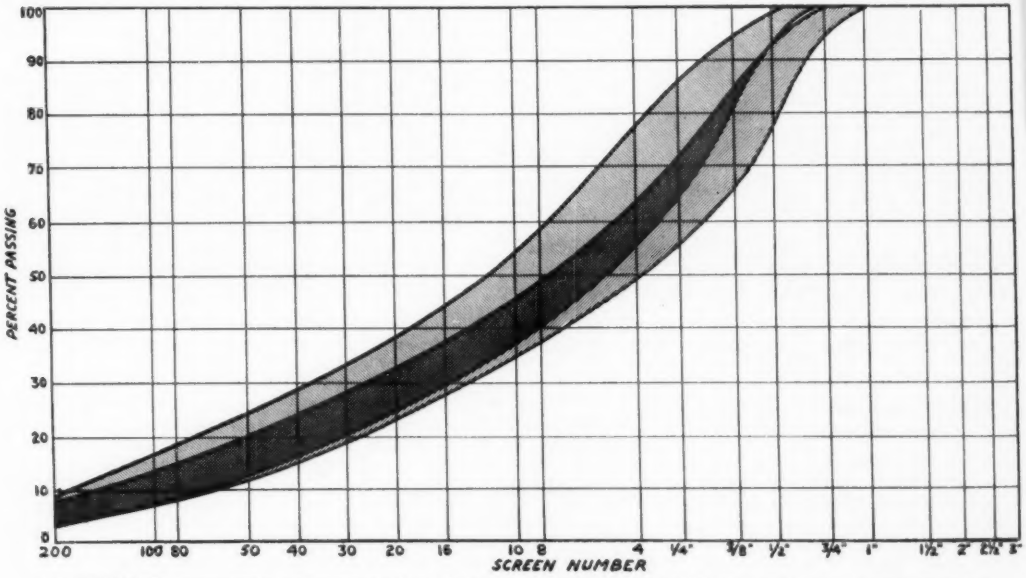
H. S. KAULBACH
Maintenance Engineer
Oakland, California

POST-war maintenance of streets on which very little work was done during the war years presents a major problem to most cities. Oakland, California, a city with 700 miles of streets probably fared no better than did other cities between 1941 and 1946 when man power, materials, and equipment were restricted. Following the end of the war, the surfaces of many of our macadam streets was raveling. A considerable number of trenches had settled due to improper backfill. These two defects were the source of much adverse comment. The raveling caused the gutters to be continually dirty and the low trenches meant a rough riding pavement. Other factors also were present which increased the roughness of the pavement. Some of these were: Natural wear over the years, automobiles stopping at boulevard stops, and pavements constructed too light for modern day traffic.

Immediate attention was indicated and a program for resurfacing was adopted as being the most feasible. With the finances available it was decided to spend between $4,000 and $4,200 per mile for this work. Specifications were written and a resurfacing 22 feet wide with a thickness of ¾ inch was adopted to stay within the financial restrictions. The program began paying dividends immediately so far as property owner reaction was concerned.

Difficulties Occur

There was, however, a fly in the ointment. Many of our streets were constructed at the turn of the century and, as was the custom in those days, a very high crown was the popular design. As the edge of the new surface was from 4 feet to 8 feet from the curb line it was difficult for automobiles to enter or depart from driveways. The exhaust pipes, and on some makes of automobiles, tips of bumpers, struck on this raised lip of the new pavement. Adjustments had to be made in the specifications and a new standard was adopted. Surfacing is now carried to the gutters and where no paved gutter exists, it is carried to the curb line. In addition, many of our streets had curb faces in excess of 7 inches. In these cases surfacing was carried to the curb line to permit filling in the deep gut-



● *UPPER belt, aggregate components for ½-in. mix; lower belt for ¾-in. Dark area shows overlap.*

ter which prevented parked cars from opening their doors on the curb side. A minimum thickness of 1¼ inches was also adopted in the new specifications. These modifications increased the costs to between $5,500 and $6,000 per mile, but it was felt that the increased thickness would add to the life of the pavement; and the additional width not only improves the appearance of the streets but also provides property owners easier access to their driveways.

Prices and Details

Work has proceeded on this program under the direction of Charles A. Reed, City Engineer, with the writer being in direct charge of field operations. No surfacing is done from October to about the middle of April, due to cold, wet, or foggy weather. Experience has taught us that raveling occurs at the edges and in the body of the mix if paving is done in unfavorable weather due to the fact that we are using the upper limits of the designed mix for the coarse aggregate. These coarse mixtures, if laid in good weather, tend to heal under the action of traffic.

Contractors bid $6.95 and $7.00 per ton respectively for furnishing and laying the Topeka-type mix. Aggregate with a maximum size of ½ inch is used for thicknesses up to 1½ inches, and a ¾-inch maximum size aggregate is used for over 1½ inches.

Paving asphalt having a penetration of 70 to 150 is used, the selection depending upon temperature ranges during the paving season and on the type of designed mix.

Preparatory work prior to resurfacing consists of removing the surface of existing pavement where a surplus of asphalt is indicated by rolls in the pavement, and in digging out soft spongy sections. Pavement broken so that it has the appearance of a mosaic is not removed if no distortion is evident. Covering this type of defect apparently is satisfactory, for some of the streets are going through the second winter without showing any ill effects. Just prior to resurfacing, the streets are thoroughly cleaned by a power sweeper, flusher, or a combination of both.

The street is then turned over to the contractor, who places the asphalt blanket and does the final clean up. The City maintains two inspectors for each of the contractor's operations, one at the plant and one on the job.

A major revision in our maintenance program will be accomplished after two or three years of this resurfacing, as the need for some of our hand raking patching crews will be eliminated.

To date, one hundred miles of city streets, principally residential, have been resurfaced. Preventive maintenance of this type means not merely maintenance of streets in their present condition by patching and sealing, but the addition of years to the life of the pavements by improving the riding qualities and by increasing the thickness. These two improvements will enable the streets to better carry the heavy loads of today's and tomorrow's traffic.

● ***THESE views show the same street in Oakland before and after resurfacing, as described in this article. The paving machine in operation is shown in the picture on the preceding page.***

Mastic Insulation for Sewage Piping

To prevent condensation and corrosion, 12,000 ft. of pipe in tunnels of the Chicago Sanitary District, were recently coated with a mastic insulation. These lines, which are 1½ to 30 ins. in diameter, carry sewage, sludge and sewage effluent. Insul-Mastic, which has a gilsonite base, was applied with a spray gun to a thickness of 0.25 to 0.38 inch.

Vacuum Filtration of Sludge in San Francisco

During the 1949 fiscal year, 5,671,300 gallons of sludge were produced at San Francisco's Richmond-Sunset sewage treatment plant. This averaged 4.08% solids. For conditioning, an average of 3.29% of ferric chloride was used, and the average production, in pounds of dry solids per square foot of filter surface, was 4.25. The filter cake contained 72.8% water. Of the 5,594 cu. yds. of filter cake produced, 4,754 cu. yds. were used on the city parks.

28 of 29 CITIES gripe about DIRTY STREETS

C. S. PRESTON

ONLY one city of 29 queried recently on street sanitation did not gripe about its dirty streets. The survey was made by the Association of Commerce of Joilet, Ill., and the questions were answered, in most cases, by Chamber of Commerce executives. These men, the least likely of all to criticize their own cities, for their jobs are just the opposite, knew that their cities were dirty, and said so in unmistakable terms.

The questions went to 46 cities in Illinois, Iowa, Wisconsin, Ohio and Michigan. Of these, ten were in the 25,000-50,000 population class; 22 had populations ranging from 50,000 to 100,000; and in 14 the population exceeded 100,000. There were 29 replies and 28 gripes about dirty streets.

That one outstanding city satisfied with the cleanliness of its business district spent nearly twice the average on street sanitation—$2.25 per capita, whereas the average spent by all the other reporting cities was $1.29 per person. This city was in the middle size bracket with a population of 47,000. The minimum expenditure reported by any city for street cleaning was 49¢ per capita, or about $36,000 for a population of 73,000. Generally the larger cities spent less per capita than the smaller ones.

Facts from the Survey

About nine out of ten of the cities reporting use at least one mechanical street sweeper; and generally standard practice reported was for this to make a "once-around-lightly" tour of the business district early in the morning. In most cases, the sweeper was followed by a pick-up truck and crew to pick up the residue left by the sweeper and clean the hard-to-get-at places.

The survey indicates that this isn't enough, since most of the cities still weren't satisfied with the cleanliness of their streets. The report states: "This approach to city street cleaning, involving one trip a day in the morning hours of pre-dawn by clean-up equipment, often leaves the business district dirty all day long after downtown merchants sweep out their stores about 9 a.m."

The survey suggested four types of clean-up equipment and the reports showed that 72% of the cities used at least three of these methods, while some used all four. The four were: Mechanical sweepers; pick-up trucks; sprinkler or flusher units; and trash cans placed on downtown corners. Of the 13 cities that used trash cans on downtown streets, nearly all reported that one per block was not enough; at least two, and preferably more, were needed.

What Is Needed

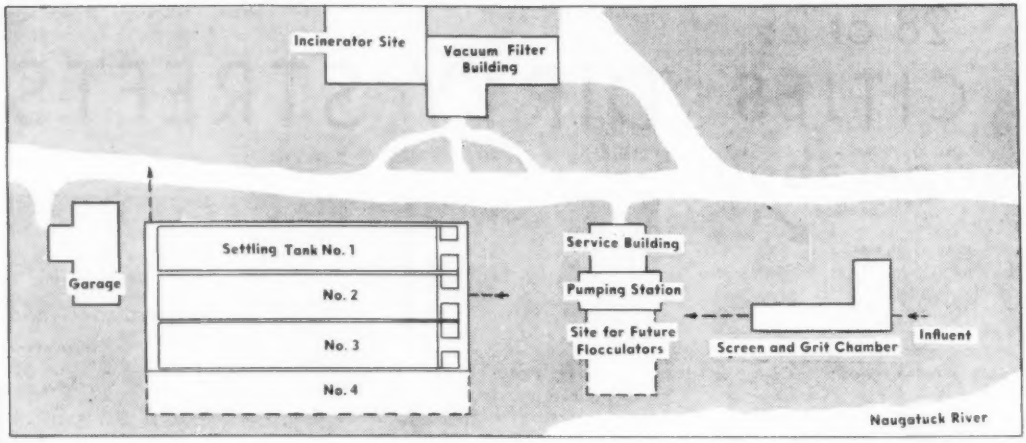
Many of the cities criticized their trash pickup arrangements. They did not regard one or two trash collections a week as satisfactory, for the problem is cleared up only briefly. One city reported there was no program for trash pickup other than a cooperative program by the merchants. This, it said, was not working satisfactorily and the city was dirty.

This report emphasizes three needs (it also mentioned a fourth —smoke abatement, which is not discussed here) of our cities in the fight for cleaner living and business conditions. These are: A higher per capita expenditure for the street cleaning department; more and better equipment; and an increased number of trash pickups per week and per day. With increased funds available for this work, and with skilled supervision, planning and direction, the problem can be solved.

It is pointed out that all cities have cleanup problems. Nearly every city has an annual clean-up, paint-up and fix-up week. But, it says: "A cleanup week is just that —a week. And being only a week, it is ineffective. Why? Because it concentrates on only 1/52 of the whole year. That means: 51 weeks of the year no one (except maybe the Chamber of Commerce cleanup committee and a few public spirited citizens) pays any attention to the problem of dirty streets downtown."

These are strong words, but they are essentially correct. A clean-up week may be a good thing, but it doesn't take the place of every-day good municipal housekeeping, and without this day-by-day toil, the clean-up week is but a delusion.

We believe that the conditions reported in these 29 cities are fairly typical of all of our American cities. This report may be a shock to the men in charge of street cleaning and street sanitation, for it tells them that the business men of their communities do not think a good job is being done. There is a remedy. It is the use of more mechanical equipment, less handwork, and correspondingly the opportunity to attract and develop better personnel.



MODIFIED PRIMARY

A. J. BENEDICT

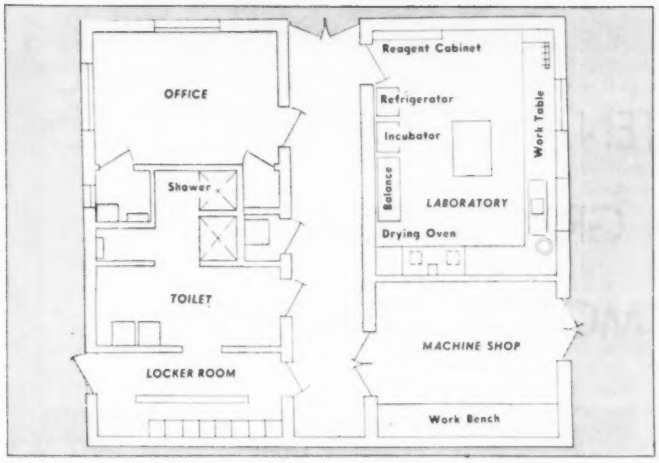
WORK was begun last January on the new 15 mgd sewage treatment plant for the City of Waterbury, Connecticut, "The Brass Center Of The World." The contract calls for completion in one year but delays in delivery of equipment, difficult problems in rock removal and other problems may extend the time necessary to complete the plant.

The location for the project was chosen by City engineers many years ago as part of a well-conceived sanitary sewage treatment program. The plant site is on the west bank of the Naugatuck River near the southern City line, a considerable distance from existing or any probable future habitations, and only a short distance upstream from the outlet of the main sewer outfall.

Although plans for such a plant had been considered for many years, not much direct action was taken until 1943 when the firm of Malcolm Pirnie conducted preliminary investigations and made recommendations for construction. But the war held up further action at that time.

In 1948 the State Water Commission nudged the plan a bit by requesting that progress be made and the following year a supplementary investigation of conditions was made by the same firm. The report on this investigation disclosed facts which caused significant

● ***CONCRETE** is handled into the forms for the plant by means of a concrete bucket and truck mounted power crane.*



● ***ON THE opposite page is shown the general layout of Waterbury's new sewage treatment plant. The existing sewer runs along the road at the top of the sketch, and the discharge from the settling tanks is returned to this trunk sewer.***

● ***FLOOR plan of the service building is shown in the sketch on this page. There is a complete laboratory, a machine shop, office, toilet facilities and a locker room.***

SEWAGE TREATMENT

changes to be made in the design of the new plant.

Plans Revised

Whereas original plant designs included conventional heated sludge digesters and open sand beds for sludge drying, the new plans discarded them.

A laboratory was set up in the City and a series of tests on composite samples of raw sewage taken at the plant site showed average copper concentrations ranging up to 25 ppm, and chromium up to 1.4 ppm. Despite a City ordinance prohibiting dumping of industrial wastes into sanitary sewers, grab samples showed as much as 120 ppm of copper and 80 ppm of chromium. The pH in 12% of all samples taken was below 4.5, and values as low as 3.0 were recorded.

These analyses and tests changed the whole sewage treatment problem as it was believed that copper concentrations sufficient to inhibit sludge digestion were inevitable, and this method of treatment was not practical at Waterbury. Therefore, vacuum filtration and drying of raw sludge with incineration was advised and subsequently adopted.

However, considering the effect of strong acids upon suspended solids in sewage and upon concrete and metal structures, efforts will be continued to eliminate this toxic material. When this is accomplished the sludge load is expected to be higher.

Some of the plant loadings and estimated removals are as follows:

BOD of raw sewage	100-150 ppm.
Reduction	30-40%
Suspended Solids	100-150 ppm.
Removal	60%
Total dry solids	6,000/8,000 lbs./day
Raw sludge (95%)	20,000 gpd.
Screenings	60-100 cu. ft./day
Grit	10-30 cu. ft./day

The plant is designed for a population of 120,000, and an average flow of 15 mgd, with a maximum capacity of 30 mgd. Sufficient area has been reserved for plant expansion.

Construction Details

The plant site of some 53 acres lies adjacent to the main outfall sewer. Normally the flow will be diverted from the horseshoe-shaped trunk sewer through a 60" reinforced concrete pipe to the screen and grit chamber. Sluice gates are to be installed at the influent chamber to permit bypassing the plant in emergencies.

A coarse bar screen with 3" openings, cleaned manually, precedes a Chain Belt mechanical bar screen with 1" openings. The latter is controlled by a time clock and float. A Chain Belt screenings grinder with a capacity of 60 cu. ft. per hour, will operate on a 20 hp motor and ground screenings will be returned to the sewage. All large motors will operate on current of 440 V.

The grit chamber, 60 feet long by 11 feet wide, will be provided with Chain Belt mechanical cleaning and washing equipment. Washed grit will be disposed of as fill.

All of this equipment will be housed in a building which also contains a garage.

Pump and Service Building

One section of this structure (59 ft. x 27 ft.) houses the sewage pumps and the other (40 ft. x 34 ft.), contains the office, laboratory, machine shop, lockers and showers.

A 60-inch reinforced concrete pipe carries the incoming flow to four economy sewage pumps. These are of the horizontal, single-end suction, vertical discharge type, driven by constant speed, geared motors at approximately 230 rpm. The pumps will have capacities of 6, 8, 10 and 12 mgd. respectively, and will operate against a normal static head of about 11 feet. Each will discharge into a cubicle overflowing into the main channel, thus eliminating the necessity for gate and check valves on the discharge line.

Provisions have been made so the raw sewage can be chlorinated at the discharge channel.

Settling Tanks

From the pumping station a 42-inch reinforced concrete pipe leads to a distributing manhole from which three 24-inch cast iron pipes

(*Continued on page 76*)

MAINTENANCE OF DIRT AND GRAVEL ROADS WITH MOTOR GRADERS

MAINTENANCE of dirt and gravel roads is subject to so many variant factors that hard and fast rules for the best method of working them are difficult to establish. Nevertheless, for the benefit of those new motor grader operators who annually come face to face with the problem, it would seem worthwhile to present a few tips regarding some of the more commonly accepted practices.

Because of differences in terrain, type of soil, amount of rainfall, kind and amount of surface material, as well as traffic density, nearly every maintenance or regrading job presents a different problem, and while the modern motor grader is the ideal tool to handle all such work, the operating procedure must necessarily be varied to fit the individual job.

Drainage—A Basic Requirement

The basic requirement of good road maintenance is, of course, good drainage. A first necessity, therefore, is to establish and maintain good drainage ditches of adequate size. In many localities the ordinary "V" ditch is adequate, while other conditions may require larger ditches with greater capacity. Additional capacity is usually obtained by making ditches wider, with flat bottom, an operation easily performed with a motor grader.

The procedure for making a flat bottom ditch is to cut to the required depth on the outside ditch line, or the point established as the bottom of the outside slope. After finishing the outside or back slope and moving this dirt up out of the ditch, a trenching cut is taken to establish the inside ditch dine. The flat bottom cut is then made with the toe of the blade following the outside ditch line and the heel of the blade on the inside line, the entire length of blade in the ditch. The toe of the blade should be slightly lower, making the outer side of the ditch just enough deeper to handle final drainage.

Regrading dirt roads and restoring drainage ditches is a fairly simple procedure with the modern motor grader. Ditches are cut to the desired size, and banks sloped back to keep them from sloughing off into the ditches. Back sloping can now be readily done with most grader blades, and is important for preservation of ditches.

Illustrations Courtesy Caterpillar

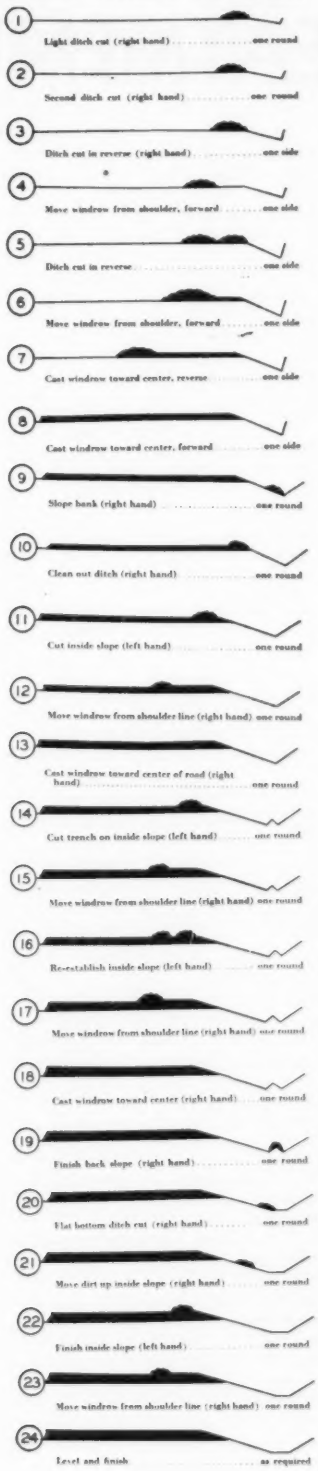
● ***FINISH** work on flat bottom ditch.*

● ***FEATHERING** out windrowed gravel.*

Surplus dirt taken from ditches and back slopes should be used to bring up low spots and improve the grade. If sod is troublesome, some operators make a trenching round along the shoulder and bury the worst of this unruly material. The final windrow is spread evenly by raising the blade enough to "feather out" the material without leaving a ridge.

Waste Material Disposal

The maintenance of proper drainage ditches for roads surfaced with gravel presents more of a problem in the disposal of waste material removed from ditches and back slopes.


1 Light ditch cut (right hand) one round
2 Second ditch cut (right hand) one round
3 Ditch cut in reverse (right hand) one side
4 Move windrow from shoulder, forward one side
5 Ditch cut in reverse one side
6 Move windrow from shoulder, forward one side
7 Cast windrow toward center, reverse one side
8 Cast windrow toward center, forward one side
9 Slope bank (right hand) one round
10 Clean out ditch (right hand) one round
11 Cut inside slope (left hand) one round
12 Move windrow from shoulder line (right hand) one round
13 Cast windrow toward center of road (right hand) one round
14 Cut trench on inside slope (left hand) one round
15 Move windrow from shoulder line (right hand) one round
16 Re-establish inside slope (left hand) one round
17 Move windrow from shoulder line (right hand) one round
18 Cast windrow toward center (right hand) one round
19 Finish back slope (right hand) one round
20 Flat bottom ditch cut (right hand) one round
21 Move dirt up inside slope (right hand) one round
22 Finish inside slope (left hand) one round
23 Move windrow from shoulder line (right hand) one round
24 Level and finish as required

● ***STEP-by-step method of cutting flat bottom ditch. Half of road is shown. If no flat bottom, skip from 13 to 24. Repeat 3 to 8 to deepen ditch.***

The most effective and satisfactory method of restoring good drainage on roads of this type, is to reshape ditches and slopes, blading the surplus material onto the road shoulder in a windrow. This windrow of loose material is then loaded into trucks with a force-feed loader and hauled to the nearest dump. Sod on the shoulder which may be obstructing drainage, should also be bladed loose and loaded along with other waste material.

Another method of disposing of this waste material, sometimes used when loader and trucks are not available, is to windrow all the gravel to the center of the road, and spread the waste evenly over surface. The gravel is then bladed back in place over the added material. This process of blading the gravel, not only disposes of the waste material, but accomplishes a regular surface re-shaping operation at the same time. As the gravel is windrowed, the blade planes a smooth base, taking out all pits and corrugations. This smooth base is then covered by the waste dirt, before the windrowed gravel is re-spread.

Road Surface Maintenance

Between ditch cleaning operations, the road surface will, of course, need to be bladed as often as permitted by the available equipment. Proper maintenance of a gravel surface requires motor graders with enough weight and horsepower to cut and plane smooth the hard-packed, rough and pitted surface. Nothing is accomplished by merely dragging loose gravel into the holes and corrugations, as it is thrown out by the first few cars that use the road.

In this cutting operation, the gravel is usually bladed from the center to the sides, or from one side to the other. With a smooth base thus formed, the gravel is then bladed back evenly over the roadway, giving maximum life to the improved travel surface.

For ordinary surface maintenance, the blade may be set at an angle of 20° to 30° from a right angle with the machine; and the blade is tilted forward until the top is somewhat ahead of the bottom. The tilt forward is increased for higher speeds, but the extreme forward tilting adjustment is used only when a dragging or troweling action is desired without movement of material.

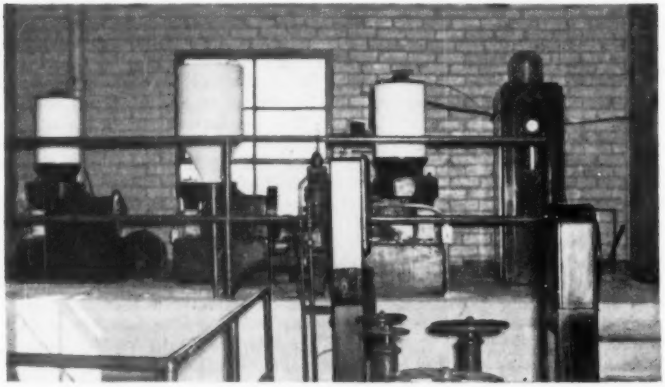
On heavily traveled gravel, the pits and corrugations sometimes become packed so hard that they cannot be cut out with the blade alone. The motor grader scarifier is then used to loosen the surface for the blading procedure above outlined. Scarifier teeth should penetrate the material and not merely scratch it. Extremely hard surfaces require fewer teeth, but at least six teeth should be used.

Modern equipment, such as the tandem drive motor grader and force-feed loader has enabled road maintenance operations to keep pace with the growing needs arising from greatly increased traffic.

● ***FEATHERING out gravel after it has been windrowed.***

SMALL WATER TREATMENT

THREE factors are important in preparing water for filtration: (1) Adding the correct amount of chemicals; (2) mixing the chemicals thoroughly with the water; and (3) sedimentation. These are as important in the small plant as in the large one. They may be attained by good design; the use of reliable and effective, but simple, equipment; and, of course, good operation. Raymond J. Faust, Chief of the Water Supply Section of the Michigan Department of Health, writes: "Our experience in the design of small water treatment plants is that there is a tendency not to provide the adequate pretreatment which is essential for all plants, regardless of size." N. M. de Jarnette of the Georgia Department of Health says: "To design a water plant which small communities can afford and which can be depended on to produce a satisfactory water at all times is a challenge to both engineer and equipment manufacturer."

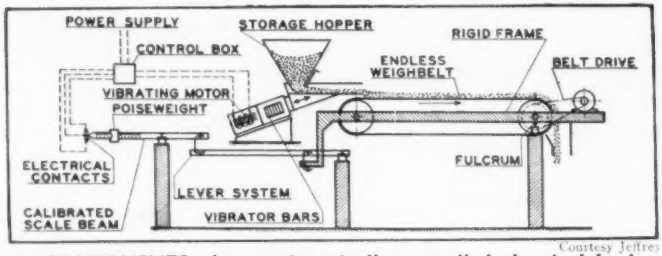


● *INTERIOR view of plant showing chemical feeders and chlorinator.*

A great deal of equipment is available for small water treatment plants. This should be studied, and there should be full use of such equipment, including these automatic features that will insure the continuous production of safe water. Space is lacking to describe all of this equipment in this article, but references are given in appropriate places below so that the engineer or superintendent can obtain additional information.

Most water works chemicals can be fed either dry or in solution, though lime and activated carbon are easiest to feed dry. Also, dry feed is simpler and often cleaner. Solution feed has the advantage that very small amounts of chemicals can be fed accurately; if necessary, the strength of the solution can be reduced to accomplish this.

In South Dakota, according to Towne, solution feed equipment has been used in several recent small plants designed to treat 100 gpm.



Courtesy Jeffrey

● *COMPONENTS of a gravimetrically controlled chemical feeder.*

In Georgia, de Jarnette believes that: "If care is exercised in securing dry feeders accurate within the low ranges required for these small plants, they are preferred to solution feeders for applying lime, alum, soda ash and activated carbon." The Texas Department of Health says: "Purification plants treating surface waters should have modern devices for measuring and adding coagulants to the water. All chemical dosing equipment, whether dry feed or solution feed, should have at least one reserve unit. . . . All chemical feed equipment should be provided with means of ready adjustment to variations in the flow of water."

Many makes of chemical feeders are available, including the following: Infilco, dry (from a fraction of a pound per hour up) and solution; Omega, dry (1 lb./hr. and up) and solution; Proportioneers, solution, any amount from 0 up; Wallace & Tiernan, dry and solution (any amount from 0 up); Bacharach, dry; Cochrane, dry and solution; Jeffrey, dry; Syntron, dry; Leupold, dry; also Roberts, Graver, General Filters, American Water Softener, Phipps & Bird, Hills-McCanna, Duriron, Milton Roy and Precision.

"Chemical feed machines should be selected with care" writes Dwight F. Metzl, Chief Engineer of the Kansas State Board of Health. "A machine which cannot be adjusted to the desired rate of feed and depended on to continue at this rate at all times—is virtually useless—the feed lines from the chemical feeders to the point of application should be as short as possible, and should be readily accessible for cleaning. Location of closed pipe conduits in concrete floors is not desirable. The location of the chemical storage space and the arrangement should be such that all handling can be conveniently done by one man."

For mixing, either mechanical mixer or channels of the baffle type may be used. Recommendations based on the observations and experiences, as forwarded to the editor, of several state sanitary engineers are presented below.

Texas.—Preliminary flash mixing and, in addition, suitable flocculation equipment is highly desirable. An ideal combination of flash mixing and flocculation would provide 1 to 2 minutes of violent agitation followed by 20 to 30 minutes of slow mixing.

Kansas.—The use of rapid mixers

PLANTS—

This is the third in a series of articles discussing design factors of water works plants having capacities of less than a half a million gallons per day. This article discusses coagulation and settling. The next article will consider filtration.

Coagulation and Settling

and slow stirrers is probably the best method of obtaining good flocculation and may be properly applied to small plants if the mechanism is of a simple type. Drive equipment, including chains and sprocket wheels should be placed in a dry pit or otherwise arranged, so it is not necessary to dewater the basins for repair or adjustment. This is especially desirable in the small plant, where reserve basin capacity may not be available.

South Dakota.—Simple mechanical mixers require less maintenance than baffle mixers, provide more positive mixing, and are more economical to construct. The mixing period should be about 30 minutes.

Tennessee.—For the treatment of surface waters, a mixing time of 30 to 45 min. is recommended.

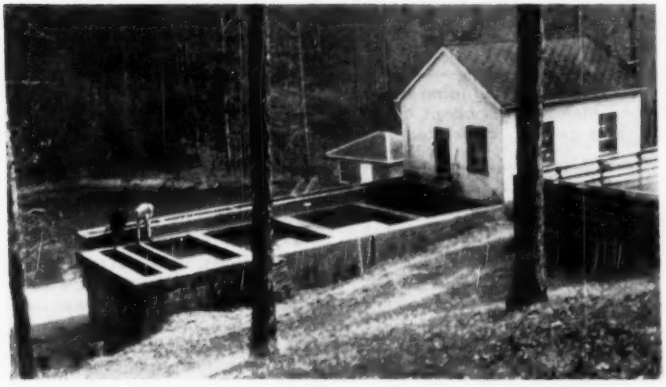
Flash mixers usually consist of a propeller driven at a relatively high speed. Since flash mixing is necessary for only 1 to 2 minutes, the tank may be very small—one to two minutes flow capacity.

Mixers for flocculation are usually of the paddle type. Frequently provision is made for a progressive reduction in speed of mixing from the inlet to the outlet.

According to de Jarnette, it may be advantageous to locate a waste overflow near the outlet of the mixing basin so that water that is inadequately coagulated and would clog the filters, may be bypassed until a good floc is established.

There are a number of manufacturers of equipment for mixing and flocculation. Space is not available in this article to describe all of this. Below are listed some of the firms making such equipment, with the number or name of the catalog or booklet in which are given specifications, a description and design data. Copies can be obtained by writing directly to the manufacturers; or, if desired, the Editor of PUBLIC WORKS will have copies sent on request.

The Dorr Co., Bulletin No. 6971; Link-Belt Co., Folder No. 2042; The Jeffrey Mfg. Co., Catalog No. 775A; American Well Works, Bulletin No. 266; Chain Belt Co., Catalog No. 48-41; Walker Process Equipment Co., Bulletins 2EM and 3S3; Ralph B. Carter Co., Bulletins 39 and 40; Graver Water Conditioning Co., Bulletin WM; the Permutit Co., Bulletin 2204; Infilco, Inc., various bulletins.



● ***VIEW of 175 GPM filter plant, Alto Medical Center, Georgia.***

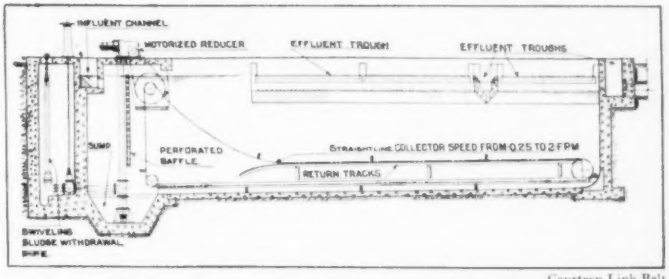
Sedimentation

To prevent short-circuiting caused by temperature changes, improperly placed baffles or an entrance velocity that is too high, rectangular tanks for small plants should be 2½ to 4 times as long as they are wide. Multiple skimming weirs at the outlet end are preferable to submerged weirs. Equipment for continuous removal of sludge appears desirable,

(*Continued on page* 59)

Georgia.—If as much as 2 or 3 ft. of head may be lost through the basin, a properly designed over-and-under baffle mixing basin gives excellent results at small plants. A minimum of 30, and preferably 45 to 60 minutes retention in the mixing basin is desirable. High velocities at the inlet end, gradually reducing to the discharge end are desirable.

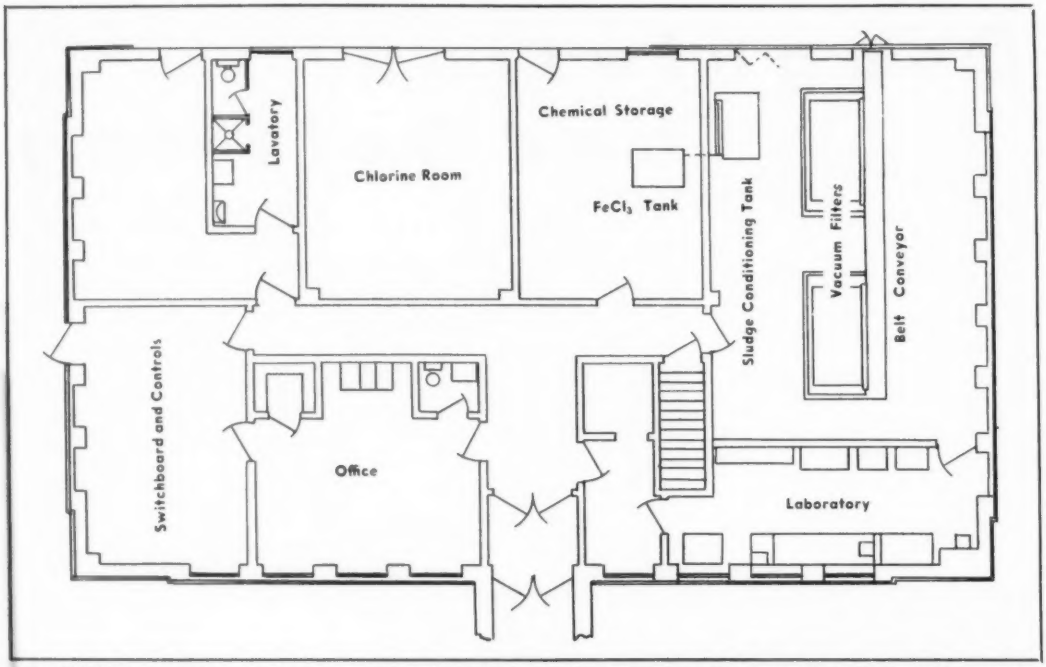
With many waters, flash mixing—a short period of quick and violent mixing of the chemical with the water—followed by a longer period of gentle mixing, gives best results.



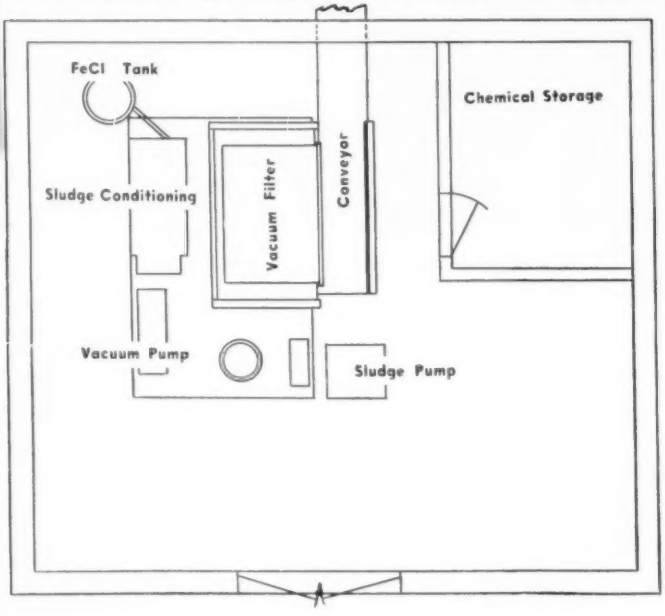
Courtesy Link-Belt

● ***TYPICAL sludge collector for rectangular settling tanks.***

LAYOUTS OF VACUUM

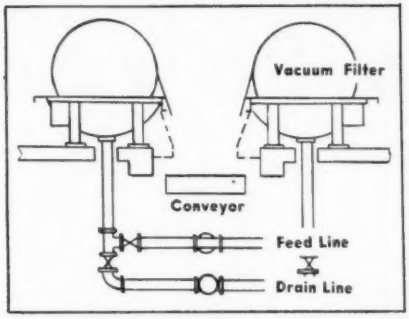


● ***OFFICE**, operating, laboratory and sludge filter building for the Town of Fairfield, Conn., includes an Oliver package type sludge filter. The entire building is about 42 ft. by 72 ft. Population served is about 40,000. Previous to filtering, sludge will be elutriated in two stages and conditioned with a ferric salt. Bowe, Albertson & Associates are the consulting engineers on this modern installation. The plant, now under construction, is of the activated sludge type. It features such modern ideas as sludge interchange, gas-engine driven sewage pumps and blowers, external sludge heating, and program controlled chlorination. Laboratory location is such as to facilitate tests for controlling filter operation. Fan ventilation is provided.*

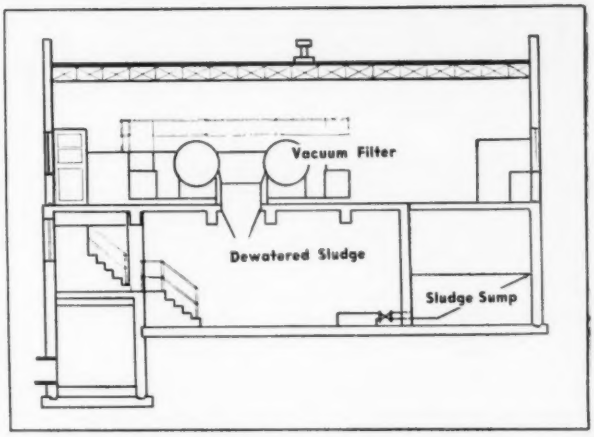


● ***FLOOR** plan of the sludge filter building at the Kirkwood, Mo., sewage treatment plant. The building is 23 ft. 6 ins. by 26 ft. 6 ins., and houses an Eimco 4-ft. by 6-ft. drum filter. The belt conveyor discharges outside of the building. A gas fired boiler is used for heating the building. This is an excellent example of the small space required for modern sludge disposal.*

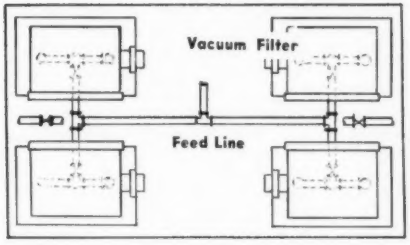
FILTER INSTALLATIONS



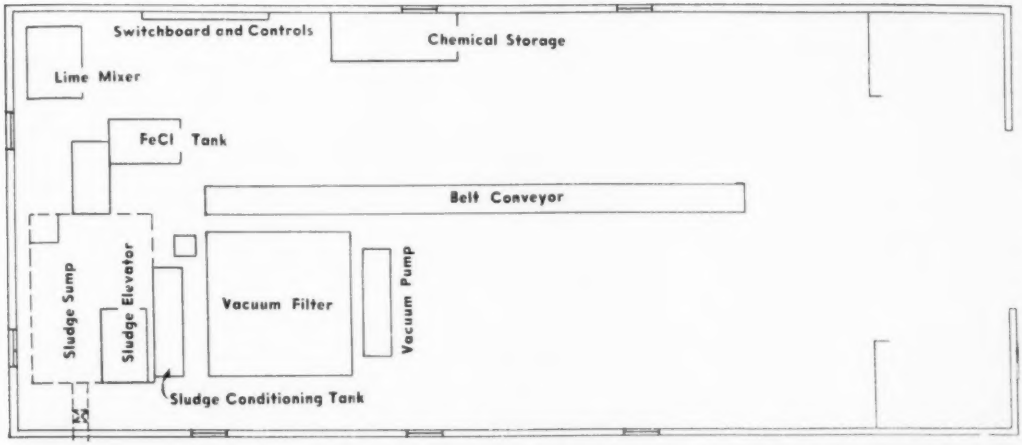
● ***SECTION through the vacuum filter installation for the Little Miami Sewage Works, Cincinnati, showing General American Transportation Co. vacuum filters discharging to a conveyor.***



● ***ABOVE is a section through the vacuum filter installation for the Village of Hempstead, N. Y., Havens & Emerson, Consulting Engineers. The filters were furnished by Eimco. This treatment plant is designed to handle 3 mgd and is of the primary type. The filters dewater raw primary sludge conditioned with anhydrous ferric chloride and lime. The sludge cake is buried. The entire building is 32 ft. 8 ins. by 45 ft. 8 ins.***



● ***AT LEFT, plan of the installation of the four General American Transportation Co. vacuum filters at the Cincinnati Little Miami Sewage Works, shown in section at left above. Dewatered sludge is discharged to a conveyor belt.***



● ***THE vacuum filter at the 1 mgd plant at Liberty, N. Y., is installed in a building 24 ft. wide and 56 ft. long. The overhead door at the right admits a truck, which is backed under the conveyor for loading. The door is closed in cold weather. Dewatered sludge is discharged directly into the truck from the filter. One man operates the plant, with part-time help in the summer. Komline-Sanderson furnished the filter. A ventilating fan in the wall near the filter removes ammonia fumes promptly.***

DIESELS Supplement Hydro Power

DIESEL-electric power units of 1000-kw. capacity at Houlton, Maine, and in two hydro-electric plants in the same general area in northern Maine, have solved a problem of maintaining dependable power service where hydro-electric plants are suffering from an inadequate water supply. The solution was a cooperative program sponsored by the city of Houlton to meet the needs for growing power requirements. In 1947-1948, for instance, power had to be supplemented by two Navy vessels.

The first of three 1440-hp. turbo-supercharged Superior diesel powered units was installed in January, 1948, at the Caribou power plant of the Maine Public Service system. The operating record of this Caribou diesel was largely responsible for the selection of duplicate units at Houlton, Me., and Tinker, New Brunswick, the following year. All three engines are 4-cycle, supercharged Superior diesels with eight cylinders of 14½-inch bore and 20-inch stroke, and each developing 1440 hp. at 360 rpm.

As a part of the emergency power program of Maine Public Service, the Houlton Water Company agreed to finance and build a diesel plant to be operated, maintained and eventually purchased by Maine Public Service. Houlton issued $170,000 in bonds to purchase equipment and construct the plant. Maine Public Service is paying off principal and interest over a 10-year period. Houlton retains title to the plant until paid off and has an option to repurchase it at the end of 10 years at cost less depreciation. During the break-in period of four months after installation the Houlton diesel plant demonstrated a high efficiency of 13.34 kwh. per gallon of fuel by generating 166,200 kwh. on 12,559 gallons of fuel, although operated only moderately.

The latest step in developing drought-proof power supply for the region was installation of another 1440-hp. supercharged diesel at Tinker, New Brunswick, by the New Brunswick Electrical Power Company, Ltd., an operating subsidiary of Maine Public Service. The diesel plant was added to the hydro plant there in March, 1949. By the end of April, it had produced 64,000 kwh. While under this load it is significant to note that only 4440 gallons of fuel were consumed, giving an average of 14.41 kwh. per gallon.

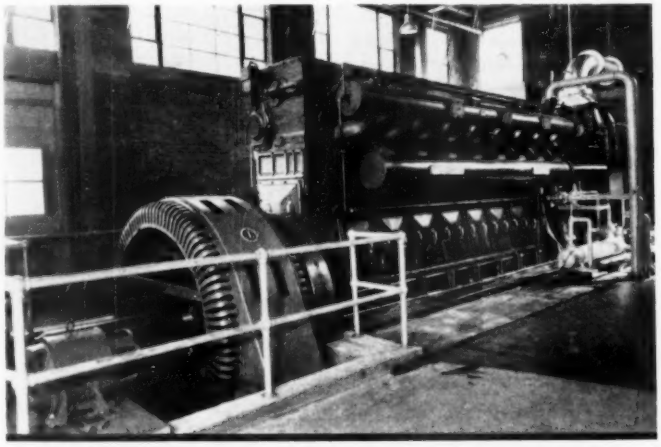
Accessory Equipment

Accessory equipment and the handling of fuel, lubricating oils and cooling water for the three diesels are similar, with only such differences as were necessitated by varying conditions in the three plants. Each engine drives directly a 1250-kva., 1000-kw. generator producing 3-phase, 60-cycle current. At Tinker and Houlton, the generators are connected directly to the 4100-volt transmission system.

The hydro stations had convenient sources of cooling water. Raw water is drawn from the river and put through heat exchangers. Separate motor-driven centrifugals for each engine circulate soft water through the exchanger and engine jackets At Houlton, since no economical supply of raw water is available, a dual radiator cooling system is provided on the plant roof. Maine winter weather required putting 200 gallons of antifreeze in the system. A 550-gpm. centrifugal pump driven by a 15-hp. motor pumps soft water through the radiators and engine jackets. Engine water temperature is kept at the specified point by means of a thermostatic regulating valve for by-passing the radiator.

All of the engines use No. 2 diesel fuel. Both the Tinker and Houlton plants can unload fuel from tank cars by gravity from railroad tracks on high embankments. The Tinker plant has two 10,000-imperial-gallon storage tanks and the Houlton plant has one 25,000 gallon tank. Motor-driven rotary pumps, controlled automatically by day tank floats, transfer fuel through a strainer and meter to an elevated day tank in the engine rooms.

Engine capacity and economy are greatly increased by a turbo-charger driven by engine exhaust gases. Air for each diesel is drawn through a 4-element viscous impingement-type filter. Exhaust gases vent through vertical silencers.



● ***SUPERCHARGED** diesel engine recently installed at Houlton, Me., to supplement hydroelectric power*

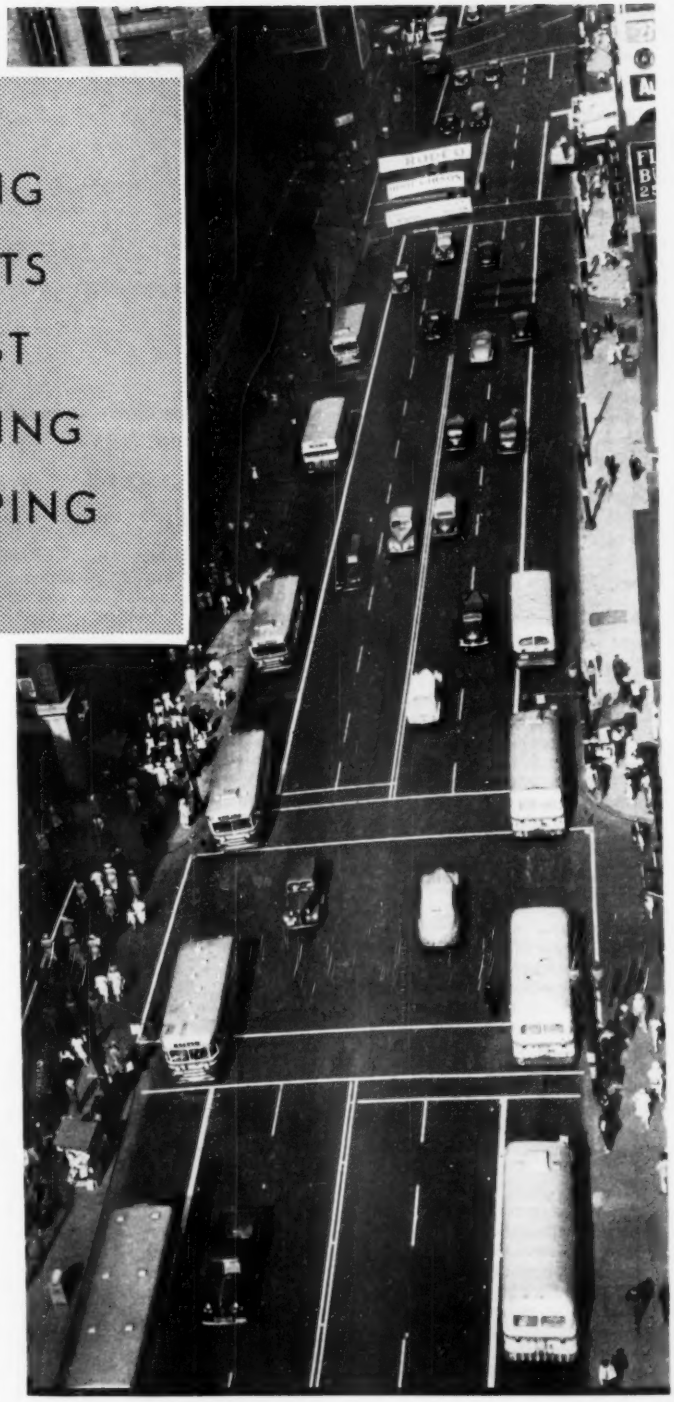
DESIGNING PAVEMENTS TO RESIST BUS STARTING AND STOPPING

STARTING and stopping of heavy buses produces a tendency for movement in the pavement. At bus stops, the repetition of the stress frequently causes failure. PUBLIC WORKS asked Bernard E. Gray of the Asphalt Institute and George E. Martin of the Barrett Tarvia Division to give us their recommendations for a pavement that would give service in bus-stop areas.

A copy of a report by W. H. Droege, Asphalt Superintendent-Chemist of Fort Wayne, Ind., was forwarded by Mr. Gray as representing excellent practice. A summary of Mr. Droege's data follows:

Fort Wayne places hot asphaltic plant mixes over old brick, asphalt and concrete streets. Pavements to be resurfaced are first core-drilled to assure that the base is suitable. If so, a hot plant-mix binder is used as a leveling course; then two 1-inch layers of the hot binder are placed. Spreading is with mechanical equipment, and rolling is with 7 to 12-ton rollers, either 3-wheel or tandem.

The composition of this binder course is as follows: Asphalt cement, 60 to 85 penetration, 5% to 6%; crushed limestone aggregates, ¾" to ¼", 60% to 65%; for regular binder, a concrete sand is used, 95-100% passing 4-mesh, 45-80%



● *BUSES line up for rush-hour service in Rochester.*

passing 16-mesh; 10-30% passing 50-mesh, and 0-5% passing 200-mesh.

Extra Strength Binder

An extra strength binder is used when increased foundation strength is deemed necessary. This contains the same asphalt cement and the same crushed limestone but in place of the concrete sand, a federal specification agricultural limestone is used containing not less than 12% of 200-mesh. This is blended 50-50 with the sand. This makes a high stability binder which costs about the same as the regular binder. The small angular particles furnished by the agricultural limestone and placed in the binder between the rounded sand grains appear to "anchor" the mixture; while the entire filler adds to the stability.

Upon the binder, either regular or extra strength, is placed a hot plant-mix surfacing. An analysis of a sample of pavement laid in 1945 and in service at a bus stop 19 hours a day since then, was: Passing 4-mesh, retained on 10-mesh, 14.80% stone particles; passing 10, retained on 16, 12.80% stone-sand grains; passing 16, retained on 50, 37.60% stone-sand grains; passing 50, retained on 200, 17.20% sand grains; passing 200, 10.00% limestone dust; asphalt cement, 7.60%.

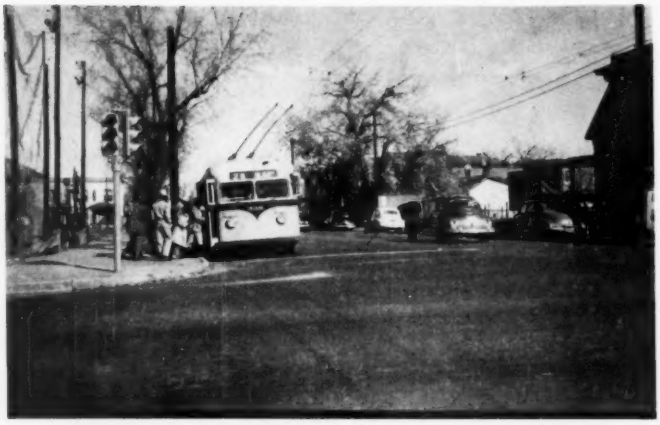
It has been found in Fort Wayne that gasoline engine driven buses are much less severe on pavements at stopping-starting areas than are electric trolley buses.

Using Angular Aggregate

Mr. Martin sent us the following comment:

There are, I believe, two actions in the area where the buses stop. One is the mechanical effect of the starting and stopping of the buses. This tends to displace the bituminous pavements, due to the mechanical action of the wheels. This force can be resisted I believe, by using a pavement which contains a high percentage of angular aggregate so that the aggregate particles are locked together. This might be done by a special type of bituminous concrete with a comparatively large amount of aggregate. It could also be done, I believe, by the use of a penetration macadam pavement. This I think would be even more stable than the coarse graded bituminous aggregate.

The other action affecting the pavement is the softening of the binder by the petroleum products spilling or dropping from the buses. This can be resisted by the use of a tar binder for either the bituminous concrete or the penetration macadam.



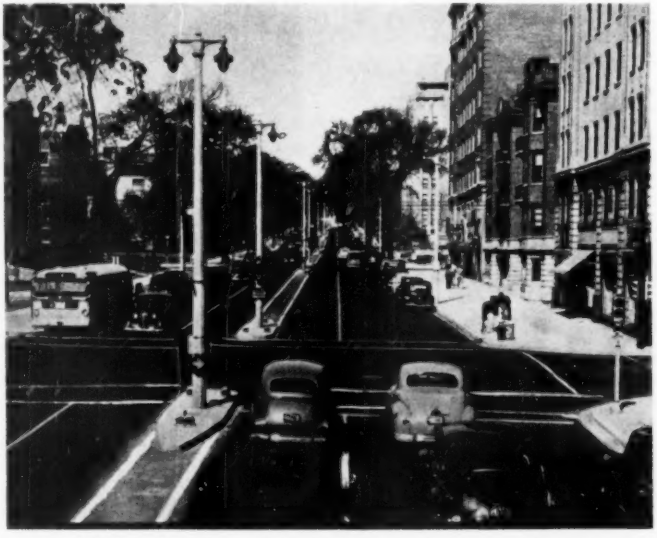
● ***ELECTRIC trolley buses are more severe on pavements.***

It might be that a tar seal coat on the top of the existing bituminous concrete would resist the solvent action of the petroleum products and thus protect the pavement. I believe that some work of that sort has been done in Detroit although I am not familiar with the details. A surface treatment or seal coat, of course, is only efficient for this purpose so long as it remains unbroken. As soon as there is a break in the seal coat the petroleum products will attack the asphaltic concrete underneath the seal coat.

So far as the penetration macadam is concerned, I do not believe that it will be necessary to change the standard specifications using a tar binder.

It would be necessary to design a tar concrete with a rather large portion of aggregate so as to give the necessary increased stability.

I must admit that these ideas are not based on any practical experience in solving this particular problem. So far as I know, no city has constructed surfaces of this sort especially for this purpose. It is true of course, that many of them have this problem and perhaps few have not solved it yet.



● ***BLACK-TOP street in Milwaukee carries heavy bus traffic.***

Richmond, Va. Cuts Bulk Rubbish Collection Costs 58%

. . . 196 Dempster-Dumpster Containers Spotted Throughout the Business Area Did the Job!

When the City of Richmond, Va. replaced their conventional open truck method of bulk rubbish collection in the business area with the Dempster-Dumpster System, it cut collection costs from $1.02 to .43 a cubic yard. From the first day the 196 Dempster-Dumpster containers were spotted at various business houses, as well as schools, apartments and hospitals, tremendous savings and amazing efficiency were evident. Six truck-mounted Dempster-Dumpsters with only one man each, the driver, service these containers, making scheduled rounds picking-up, hauling and dumping one pre-loaded container after another. The tightly closed steel containers, ranging from 6 to 12 cu. yds., eliminated objectionable odors, rats, and stopped trash and rubbish from being littered over streets and alleys by winds and scavengers.

This new system got the immediate and enthusiastic support of the local business people. Some 30 letters were received by the city during the first 60 days of service commending the Department of Public Works for installation of the Dempster-Dumpster System. The following are typical comments of the people:

"We can sincerely say that this is the finest service ever rendered us by the City Refuse Collection Dept. We can recommend this service to anyone who wants to get rid of trash in the most economical way. We are delighted with the Dempster-Dumpster System and would not return to the old method of refuse collection under any circumstance. . . . This equipment has come up to our expectations 100%. We have placed orders for 6 more containers."

The Dempster-Dumpster principle—quick pick-up of containers pre-loaded by users—is applied not only in business areas, at hospitals, schools and apartments, but wherever bulk refuse accumulates . . . including market and housing areas . . . and at tremendous savings! Pick-up, hauling, and dumping action is shown in the photos above. Write today for "What They Think of the Dempster-Dumpster in Richmond, Va." The Dempster-Dumpster is another product of Dempster Brothers, Inc.

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MECHANICAL TREE TRIMMING and Chemical Weed Eradication

C. E. BROKAW
Supt. of Highway Maintenance,
Cincinnati, Ohio

IN order to reduce the cost of tree trimming and tree removal, and also to eliminate many of the hazards normally associated with such work, the Highway Maintenance Division has designed equipment to accomplish this work as a mechanized operation.

A standard truck chassis of the 19,000-lb. gross vehicle weight class was acquired and equipped with a mechanical extension ladder assembly. A special dump body was constructed to provide limited space for hauling cuttings; compartments for tools, both hand and power, are provided in this unit. A portable high-cycle generator and two powered chain saws were purchased. One of the saws is a light electric saw for top cuts, while the other is a heavy gasoline powered job for heavy cuts. The weight of the electric saw is only 19 pounds, which permits easy handling for top cuts which were formerly made with hand saws.

The ladder, which can be operated and extended in all directions to its maximum reach of 30 ft., is extremely valuable in tree trimming. In large tree removal it serves only to facilitate getting into the tree, as the climber must reach the top, begin making his top cuts, and lower the limbs.

The mechanical outfit described cost $7,000, complete with the power tools. The crew consists of a labor foreman who operates the tree removal truck and equipment; a truck driver operating a separate dump truck for hauling away the material; a specially classified laborer as a tree climber; and two regular laborers who perform most of the low work, under-cutting roots, loading the truck and handling traffic.

This tree service unit provides complete facility to cut, trim and remove trees at isolated points, permitting hauling and disposal of the cuttings and the necessary transfer of workmen. If the work is concentrated in one location, more trucks may be assigned for hauling, thereby speeding up the work. This organization results in a marked reduction in the cost of tree maintenance. The truck with its aerial ladder is useful also for many highway operations, including maintenance of drains under viaducts, installing new globes in outdoor floodlights, inspection of walls adjacent to street pavements and street yard operations.

Weed Eradication

A new method of applying 2,4D in concentrated solutions has been developed, using a specially designed pump and mist spray nozzles. This has been found efficient and economical. With this outfit, it is possible to spray an acre of weeds with 5 gallons of solution. The solution is prepared by mixing one quart of 40% 2,4D ester concentrate in 5 gals. of water. The pump can be operated by any unit equipped with a power take-off.

Cincinnati has also used a standard 1,500-gal. street flusher for weed eradication, adding a spray bar and a recirculation pump to insure continued mixing of the solution. A solution is made by adding 11 pounds of 2,4D salt to 1,000 gals. of water. The rate of application is controlled by regulating the truck speed, which is usually held to about 5 mph. In an 8-hr. day, three loads of weed killer have been applied on the berm of 15 miles of highway. The crew consists of two men. Some difficulty has been experienced by drift of spray in windy weather; and in some cases control has been spotty, requiring retreatment. Best results are obtained where treatment is applied when initial growth does not exceed a foot in height. This requires retreatments within about 6 weeks in order to control growths which germinate later. Our work has been successful in controlling weed growth and the cost has been lower than by the conventional weed cutting methods.

The village of Indian Hill, a suburb of Cincinnati, has attached one of the special pumps mentioned above to the power take-off of a tractor power mower. The sickle bar was removed and a spray bar attached in its place, using a coupling device. A 5-gal. container was fastened to a small shelf welded to the rear of the tractor. This furnished sufficient solution for several hours of roadside spraying. The versatility of the tractor and its controls are helpful. The operator can clear roadside obstructions by raising the spray bar by the use of the usual mower controls.

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—just off of the press—a bulletin on Layne Short Coupled Service Pumps, showing many diagrams of application for circulating and process pumping, lake and river intakes, drainage, line boosters and de-watering uses. Write for your copy today.

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WHEN standby power is needed, it is needed badly. Standby equipment should therefore be of first quality and properly designed for the work it has to do. These principles are demonstrated in the standby diesel power plant of Plattsburg, N. Y. That city voted in 1937 to establish a municipal power system. Purchasing the existing distribution facilities within the city limits, it contracted with New York State Gas & Electric for power from the hydro stations on the Saranac River. To provide insurance against power shortages or failures, the city determined to install standby generating facilities. Three 1,000-hp Fulton diesel engines were installed in 1941, and these have produced more than 16 million kwh since that time.

The diesels are used to supplement hydro power when water is low. Thus, plant production is small in the spring, rises to a peak in the summer and early fall, and again rises moderately in the late winter. Production varies greatly from year to year, and also from month to month. In 1948, engine hours per month varies from 73 in May to 1,120 in September. Total power generated in 1948 amounted to 3,051,100 kwh.

Details of the Power Plant

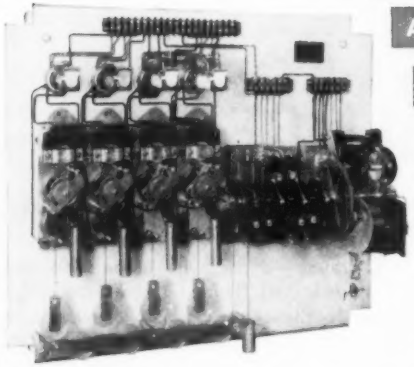
The engines are 4-cycle, mechanical injection, 8-cylinder units; bore is 17½ ins. and stroke 24½ ins.; each of the three units is rated at 1,000-hp. Over the 8 years of operation, 13.76 kwh have been produced per gallon of fuel, and in 1948, the rate was 14.09 kwh per gal. Lubricating oil consumption in 1948 was 10,285 hp-hrs per gallon.

Only soft water enters the engine jackets and a closed cooling system prevents contamination. The water is circulated by one Buffalo and two Ingersoll-Rand motor driven centrifugal pumps from a hot well, through the diesels and through the coils of three Buffalo evaporative coolers. Coolers and pumps are arranged so that any combination of units may be used. Thermostatic controls bypass water around the coolers and position cooling shutters to maintain the cooling water at prescribed temperatures. For make-up, city water is treated in a Graver zeolite softener.

All intake air is cleaned in three American Air Co. oil-bath filters placed just outside of the building. Three tanks holding 44,000 gals. provide the fuel supply. All fuel is metered and filtered before reaching the engine injection systems. There is always at least one operator in attendance. Generators are General Electric and the switchboard is Westinghouse.

The department has been able to keep rates low and still show a reasonable margin of profit. In 1948, the average rates, per kwh, were: For residential customers, 2.92¢; for commercial 2.56¢; and for industrial 1.30¢. There have been contributions to the city of more than $127,000 during the eight years of operation; $133,000 plants bonds have been retired; and there is more than $137,000 on hand. S. W. Niles is business manager and W. W. Gottburg is plant superintendent.

BUILDERS *Pressureflo Control*



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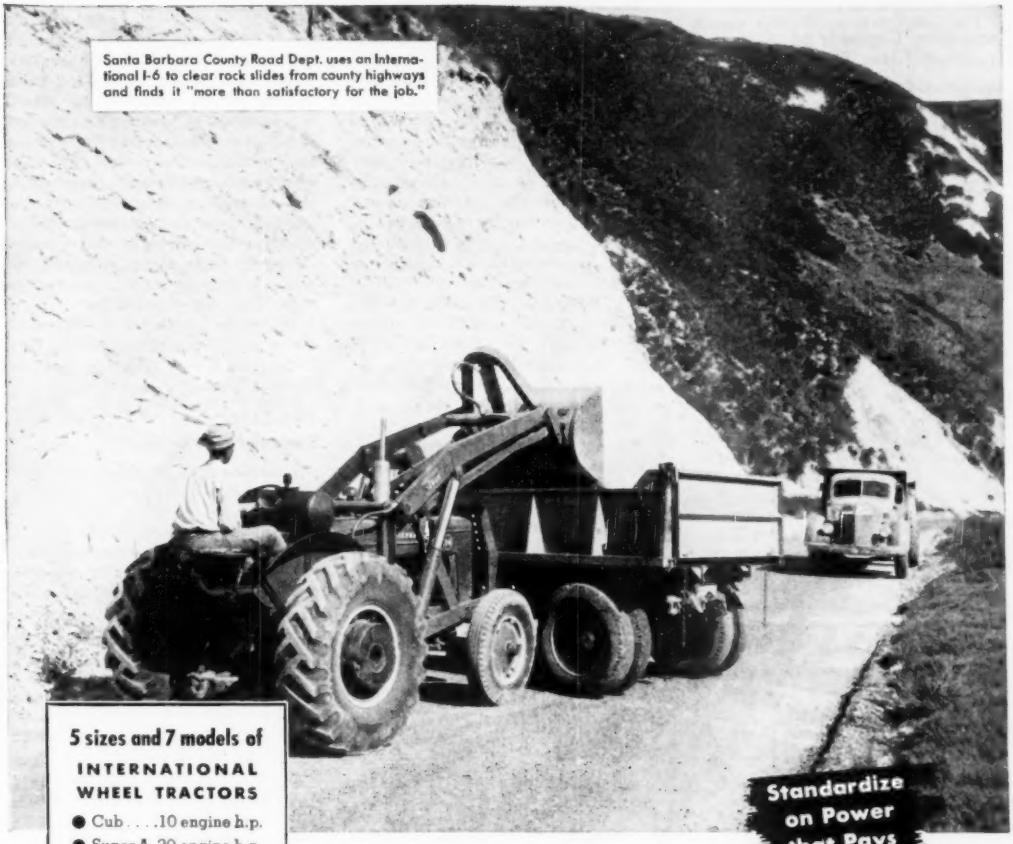

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PUBLIC WORKS DIGESTS

SEWERAGE AND REFUSE . . 54 • HIGHWAYS AND AIRPORTS . . 62 • WATER WORKS . . 69

This section digests and briefs the important articles appearing in the periodicals that reached this office prior to the 15th of the previous month. Appended are Bibliographies of all principal articles in these publications.

THE SEWERAGE AND REFUSE DIGEST

Increasing Capacity of Trickling Filter Plant

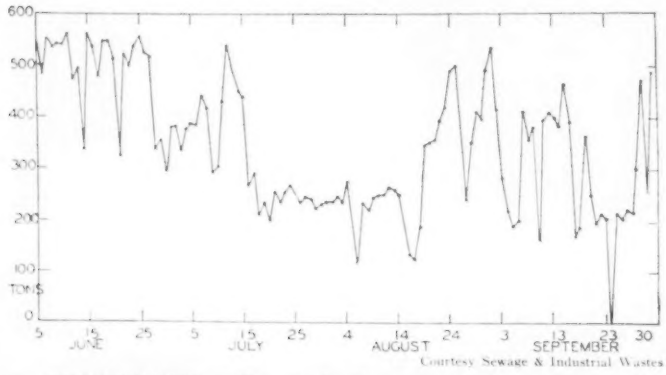
A plant built in 1937 for Woodridge, N. Y., a summer resort, contained two primary clarifiers, low-rate trickling filter, secondary clarifier, unheated digester, and glass-covered sludge beds. In 1947 the effluent from this plant was so strong and discolored as to cause serious nuisance. A laundry contributed about 20% of the summer flow, which reached a maximum of 0.7 to 0.8 mgd; but the winter flow fell to 0.125 mgd without the laundry waste. The dosing tank overflowed during maximum flows, distribution to the trickling filter was poor, and the secondary settling tank (located in a swamp) had settled so the weir was 6" out of level and its concrete was severely decomposed. The 8" and 10" cast-iron pipes connecting the several units were too small, and were replaced with 14" Transite, the old iron pipe being used for recirculation in connection with the change to high rate filtration. This change involved recirculating 500 gpm of filter effluent to the primary settling tanks and 250 gpm from the secondary settling tank to the dosing tank. In addition to the general change in plan, the dosing tank was reconstructed, a new distributor substituted for the old, the secondary settling tank repaired and a level weir installed, and pumps installed for recirculation, using the salvaged cast-iron pipe referred to above. Provision was made for installing a rapid sand filter when necessary, but the result (11 ppm BOD in the final effluent) was so satisfactory that sand filtration has not been installed up to the present time.

"Changing a Low Rate Filter to a High Rate;" *PUBLIC WORKS*, July.

Using Sodium Nitrate In the Androscoggin River

To control the pollution of the Androscoggin river by sulfite wastes, the administrator, placed in charge of this by the court, during 44 days in the summer of 1949 added 641.5 tons of sodium nitrate to the river. When added to water about to become anaerobic, the nitrate oxygen was readily utilized and ammonia was the principal reduction product. Use of sodium nitrate permitted a more flexible and economic use of the river as a carrier of sulfite waste liquor by reducing its capacity to create a hydrogen sulfide odor nuisance. The cost was $45,000.

Walter A. Lawrance — "The Addition of Sodium Nitrate to the Androscoggin River;" *Sewage and Industrial Wastes*, June.



Courtesy Sewage & Industrial Wastes

• ***COMPENSATED** sulfite production load in the Androscoggin.*

Two-Level Sanitary Fill

Winnetka, Ill., population 17,000, has for three years been disposing of its refuse by sanitary fill on 70 acres of marshy land in close proximity to high class residential property. The method is fully satisfactory from the standpoints of public health, appearance, and effect on surrounding property. In operation, a trench is dug about 5 ft. deep and filled to the ground level by trucks backing in over the refuse already deposited. When the trench has been filled it is covered with 6" of earth or cinders. The second lift is started from the far end and progressed toward the access road, and is covered with dirt excavated from the next trench. The deposits the first year raised the fill over approximately 1 acre to 3¾ ft. above the original grade, raised to 6½ ft. in 1948 and to 7½ ft. in 1949. The original volume has been compacted between 20.5% and 23.2%. The total settlement of the fill has been about 6". The density of compacted fill has varied be-

tween 1954 and 1734 lb. per cu. yd. The equipment used is a tractor equipped with a Drott "Bullclam" shovel, and a ½-yd. dragline, which are housed in a sheet-metal shelter located at the fill. The cost in 1949 was 42¢ per ton for labor, 18¢ for equipment, 11¢ for depreciation and 1¢ for materials and supplies.

"Two-Level Sanitary Fill:" *American City*, July.

Sludge Composting In Baden-Baden, Germany

This city of about 45,000 now has under construction a sewage treatment plant designed for 1.8 mgd dry-weather flow. It contains a screenings disintegrator similar to the "Comminutor;" two settling tanks with provision for chemical precipitation and chlorination, and sludge thickening mechanisms. Primary digestion of the sludge is followed by elutriation, and then by secondary digestion. A gas holder is provided for storing digester gas. Digested sludge will be coagulated with ferric chloride and dried on beds.

Both the sludge and the gas are to be utilized. The gas will be purified of hydrogen sulphide and carbon dioxide and compressed to 350 atmospheres and used as fuel for motor cars. The sludge will be composted with the city's garbage, rubbish and ashes, the mixed refuse having first been passed through a drum screen which separates out that between 15 and 100 mm for composting, the finer and coarser being disposed of otherwise. This refuse will be thoroughly mixed with digested sludge to a fairly dry mix having at least 60% solids, which will be deposited in compost piles 10 ft. high provided with aeration channels and chimneys. During the first month the organic matter is fermented with aerobic bacteria and molds, reaching a temperature of 160-170°, which will fall to 100-120° during the following 3 or 4 months. It then is passed through a 15 mm screen, material coarser than this being disintegrated in a hammer mill, and the product sold for fertilizer. It is expected that the gas will yield a revenue of 90,500 marks per year, and the compost 47,400 marks, giving a net profit over operation cost and capital charges of 5,-600 marks. The plans and financial estimates are based on results obtained with a pilot plant constructed in 1948, the compost from which sold readily to farmers for 8 to 10 marks per cu. meter ($1.80 to $2.30 per cu. yd.)

Franz Poepel — "Clarification and Sludge Composting Plant at Baden-Baden, Germany;" *Sewage and Industrial Waste Engineering*, July.

A Pneumatic Sewerage System

In 1914 a French village adopted a sewerage system designed by Pierre Gandillon for a very flat area with high ground water. It was later modified, and in 1934 was essentially as described below. All sewers are 8" cast-iron pipe, with air-tight lead joints, laid at a 0.1% grade. To prevent deposits in it, house sewers are not connected to but discharge into sumps, 3 or 4 houses to a sump, where the solids settle. A sewer main passes through the sump, and a branch drops vertically to the bottom of the sump, up which the liquid rises into the main and flows to the outlet. The mains are all led to a main collector, which is connected to a vacuum pump. This pump is operated once each day, and, by means of valves hand-operated by the employees, each 8"

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sewer in succession is placed under a vacuum for a few minutes. This sucks the deposits from the sumps, through the branch, into the sewer; the end of the branch being stopped, when the sump is nearly empty, by a ball which floats on the sewage in the sump.

A Szniolis — "Gandillon's Complete Municipal Sewage System;" *Sewage and Industrial Wastes*, June.

Sand Beds vs. Shallow Lagoons

Since 1948 the Los Angeles County Sanitation District's staff has been comparing the relative efficiencies of underdrained sand beds and shallow earth lagoons in air drying of digested sludge. It has reached the conclusion that the latter is by all odds the most economical method for the climatic conditions of Southern California. Originally twenty 60 x 100 ft. sand beds were built with 6" of graded gravel and 4" of sand with provision for 14" depth of sludge. On these were dried an average of 663 tons of sludge per acre per year. Beginning in 1930, earth lagoons, called "field beds", have been used and enlarged and since 1937 have been used exclusively, the beds now numbering 23 with an average area of 1.14 acres. The dikes permit filling to a depth of 3½ ft. but the depth seldom exceeds 2 ft. The soil is a tight clay which allows little if any infiltration. Weirs permit drawing off and returning to the sewers as much supernatant water as possible. When a crust has formed, a small tractor is driven through the sludge to turn it over and expose the wet material beneath, which almost doubles the amount that can be dried. The amount dried averages 683 tons per acre per year—more than was possible on the sand beds. The beds are operated by a contractor, who pays for the sludge delivered and removes and disposes of it. The same contractor buys and removes sludge from sand beds in the Terminal Island plant of the city of Los Angeles, and his cost at the latter in 1949 averaged $3.00 per ton, while that at the lagoons was $1.25 per ton. The District's cost of operation was 29 cents per ton. Its cost of operation for the sand beds in 1934 was $2.75 per ton, which would probably be $5.00 at present prices. Analysis of dry solids contents of applied sludge, decanted liquor and sludge removed indicates a loss of about 10%, probably lost by further digestion and oxidation during the drying period.

A. M. Rawn and W. F. Garber — "Sands Beds vs. Shallow Lagoons for Sludge Drying;" *Water & Sewage Works*, July.

Sewerage of the Colne Valley, England

Approaching completion is a system of intercepting sewers and a treatment plant for collecting and disposing of the sewage from 14 city, county and rural districts in the valley of the Colne river, which already had 30 treatment works, most of which are to be abandoned. Sewage from the local sewerage systems will be collected by 55 miles of trunk sewers 15" to 75" in diameter. To reduce to a minimum the pollution reaching the river, provision is made to receive 6 times a dry-weather flow of 48 gal. per cap. per day. The plant is required to so treat this amount as "not to discharge any effluent having a B.O.D. above 20 ppm or suspended solids above 30 ppm.," and that the effluent pass the test for putrescibility. The activated sludge system of purification was adopted, with capacity sufficient to

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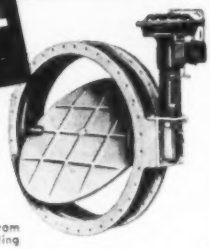

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give 1.5 cu. ft. of air per (Imp.) gal. of d.w.f. with 12 hr. aeration. The primary sedimentation tanks provide 7½ hr. detention based on d.w.f., and another 6-hr. detention for storm-water treatment, or 13½ hr. based on d.w.f. The aeration tanks are designed with the longitudinal ridge and furrow system (generally replaced some years ago in the U. S. by the spiral flow). Provision is made for returning sludge in amount normally 65% of the d.w.f., with a maximum of 150%, with reaeration of the sludge. Final settling will be in upward-flow tanks.

Digestion tanks have a capacity of only 0.9 cu. ft. per capita. (It apparently is the English practice to discharge sludge with only 35 to 45% of the volatile matter digested, while 60 to 65% is considered desirable in the U. S.) Primary sludge only is digested, to produce gas for power. Digested and surplus activated sludge will be vacuum filtered and flash dried, using Oliver filters and the Raymond system. Either both sludges or only the activated sludge may be dried for fertilizer.

W. Fillingham Brown — "Sewage Works in the Colne Valley Area, Hertfordshire, England;" *Sewage and Industrial Wastes*, June.

Purification In Lagoons

The greater part of the sewage of Melbourne, Australia (population 1,250,000), is purified by land treatment on a 25,000-acre farm 20 miles from the city: by rotational irrigation of pastures with raw sewage in the summer and the continuous surface application of settled sewage to grassed areas in the winter. Part of the land was not suitable for this treatment but could be used for lagoons, and a study of such use was begun in 1940. As a result of this study the following conclusions were reached.

The most satisfactory continuous form of lagoon treatment of raw sewage is by passing it first through an anaerobic lagoon for sedimentation, digestion and partial BOD removal; then through an aerobic lagoon for complete BOD removal and stabilization. Purification in the former is due to a digesting sludge layer deposited on the bottom of the lagoon; its purifying capacity is much greater than that of an oxidation pond or aerobic lagoon. The capacity at Melbourne is 600 lb. of BOD per acre per day at average 64° F and 450 lb. in winter at 52°, with a detention time of 5 days. The purifying capacity of the aerobic lagoon increases with the BOD load up to 82 lb. of BOD per acre per day. The maximum performance giving a satisfactory effluent is 65 lb. BOD per acre per day.

The presence of algae in the aerobic lagoon probably increases its capacity for purification. Apart from appearance, there is no objection to discharging algae-containing effluents to the river, as they increase rather than deplete the oxygen content of the receiving water. Partially purified filter and land treatment effluents can be completely purified by continuous treatment in aerobic lagoons.

C. D. Parker, H. L. Jones and W. S. Taylor — "Purification of Sewage in Lagoons;" *Sewage and Industrial Wastes*, June.

Training Sewage Works Operators

Sewage Works short course training was reported by 26 states in 1948. Training for more than 2,000 persons was provided by 18 statewide schools, 9 regional-type schools, 1 state localized-type

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school and 1 university extension correspondence course. Four states have mandatory certification and 11 offer voluntary certification. Course content deals with subject matter under 60 typical headings with major emphasis on laboratory techniques, chemistry, sludge digestion and disposal problems, filters, chlorination, and operators' discussions. Lacking in emphasis are such topics as public relations, relation of sewage to health and disease transmission, state requirements, and industrial waste treatment.

William T. Ingram — "Training Sewage Works Operators in the United States;" *Sewage and Industrial Wastes*, June.

Treatment of Meat Packing Wastes

The first stage of treatment of such strong wastes as those produced by packing houses should be within the plant itself, where the strength should be reduced to the lowest possible value by salvage operations. Grease should be considered a by-product and its recovery be nearly complete. Appreciable reduction of suspended solids can be effected by screening out paunch manure. This is necessary also because otherwise pumping sludge is almost impossible due to the matting effect of the straw in the paunch manure. Digestion of packing plant wastes offers no particular problems if scum formation in the tanks is controlled. Rapid and complete removal of activated sludge from final settling tanks is of paramount importance.

Leland Bradney, Walter Nelson and R. E. Bragstad — "Treatment of Meat Packing Wastes;" *Sewage and Industrial Wastes*, June.

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The Addition of Sodium Nitrate to the Androscoggin River. By *Walter A. Lawrance*, Prof. of Chem., Bates College. June, Pp. 820-832.

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Operating Experiences at Grove City, Pa. By *J. N. Hagerich*, Operator Sew. Plant, Grove City, Pa. June, Pp. 839-841.

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Clarification and Sludge Composting Plant at Baden-Baden, Germany. By *Franz Poepel*, Prof. of Mun. Eng., Stuttgart Inst. of Technology. July, Pp. 354-356, 378.

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The Capacity of Sewage Pumping Station Suction Wells. By *C. E. Keefer*, Dep. Sew. Engr., Baltimore, Md. July, Pp. 295-296.
Underground Water Pollution Abatement in Los Angeles. By *John H. Ashley*, Industrial Wastes Engr., Los Angeles. July, Pp. 297-299.

Small Water Plants

(*Continued from page* 43)

whether rectangular or circular tanks are used. A detention of 4 to 6 hours should normally be provided. In a plant providing 200 gpm, a 4-hour detention would, with a depth of 8 ft. result in two rectangular tanks, each 10 ft. wide and 40 ft. long; or a single circular tank about 35 ft. in diameter.

Recommendations or suggestions from various of the state sanitary engineers include:

South Dakota.—A retention period of 6 hours for small plants using plain sedimentation basins is recommended. In one plant using an upflow type, the overflow rate is one-half that approved for large installations.

Kansas.—In small plants it is necessary to use greater length-width ratios than in large plants, and a ratio of 4 to 1 appears to be necessary to prevent short-circuiting; even this could be increased with beneficial results. In shorter tanks, currents and channeling of flow interfere with settling. The importance of designing inlets and outlets to distribute and collect the water as uniformly as possible cannot be overemphasized. The slotted or perforated baffle is effective; submerged ports and a hanging baffle to 18 inches below the water line help. Pipes, conduits and openings should be large enough to prevent breaking up the formed floc. A short drop over a weir may break up floc enough to delay settling considerably.

Georgia.—A theoretical detention

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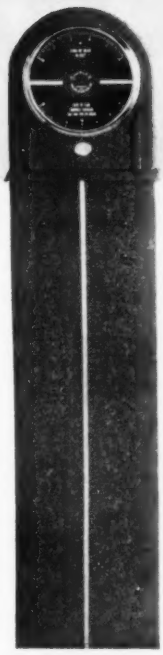

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period of six hours is desirable. Rectangular settling basins with a length to width ratio of 2.5 or 3 to 1, or even more, appear to give better effluents. A stilling wall or baffle to provide uniform distribution, both vertically and horizontally, is desirable. Multiple skimming weirs at the outlet are far superior to submerged weirs.

Tennessee.—A settling time of four hours minimum is recommended.

Texas.—Basins for flocculation and sedimentation should provide a total retention of 6 to 8 hours. There should be at least two tanks, designed to operate in parallel.

Considerable data on the details of design for settling tanks using mechanical sludge removal equipment are available as indicated below. Requests for such booklets may be sent directly to the manufacturer or to the Editor of PUBLIC WORKS.

Jeffrey Mfg. Co., Bulletin 615; Link-Belt Co., Book 1742 for rectangular tanks and Book 1982 for circular tanks; the Permutit Co., Bulletin 2204; Ralph B. Carter Co., Catalog 4906; Walker Process Equipment Co., Bulletin 9S45 for circular tanks and Bulletin 8S34 for rectangular tanks; Chain Belt Co., Catalog 309; American Well Works, Bulletin 253A; The Dorr Co., Bulletin 6191 for Clarifiers and Bulletin 6801 for clariflocculators, also a 36-page bulletin on sedimentation tank design factors; Infilco, Bulletin 2450.

INDUSTRIAL WASTE RECOVERY BY DISTILLATION

VERY great advances have been made in distillation in recent years. Conpression distillation will now produce from 175 to 350 pounds of distilled water for every pound of fuel burned, the ratio increasing with the size of the unit. If electric motor powered, the power consumption may be as low as 60 kwh per thousand gallons of water produced. With diesel engine drive, the power consumption may be as low as 3 gallons of diesel fuel per thousand gallons of water. Total energy costs per 1,000 gallons of distillate will be about 76 cents.

Compression distillation is also being applied to the disposal of industrial wastes. Solids in solution in the raw water (or other vehicle) are not removed, and the process can therefore be utilized to recover valuable solids or to reduce the volume of diluting water or of industrial wastes that have to be disposed of otherwise than in sewers or streams. At a paper manufacturing plant, the black liquor wastes are being concentrated by distillation into a solution which can be utilized for fuel in the plant boiler shop. This installation also recovers chemicals; and enables the plant to meet state anti-pollution laws.

A distillation unit of this type is being used for concentrating penicillin slurry for by-product recovery. The annual saving is estimated at $15,000. A meat packing plant recovers valuable solids in stick water and brine solutions; a tannery uses this method for concentrating waste liquors; and a chemical manufacturer is concentrating molasses stillage.

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1,000 gals. per hr. (24,000 gpd) are portable, and are capable of ready movement from place to place.

Water produced from salt water is bacteriologically sterile and chemically pure. Other methods of getting fresh water from salt are: By freezing; by ion exchange; or by electrolysis. On water having the characteristics of sea water, with about 3½% dissolved solids content, compression distillation is far the cheapest. In the case of brackish water, having a salt content just above the potability level, ion exchange may have advantages.

For many industrial wastes, compression distillation may provide the most economical solution. The chemical analysis of the liquor to be distilled or concentrated; the quantity to be handled; the initial and final concentrations; the heat stability of the material; the boiling point; the maximum allowable temperature; and the power and fuel costs are all factors to be considered. With these at hand a reasonable analysis of the problem is possible.

Water Supplies for Pipe Line Stations

THERE are five pumping stations on the Ozark pipe line from Cushing, Okla., to Wood River, Ill. This pipe line can handle up to 205,000 barrels of crude oil a day. The stations are equipped with one 600-hp and three 1,250-hp motor driven centrifugal pumps; and there is also an additional 700-hp pump at each station.

Water is required for these stations for domestic service (about 1,500 gpd); for cooling the bearings of the main line oil pumping units (about 21,500 gpd); and for heating plant boiler feed.

Wells furnish the supply, and the water is pumped by deep well turbines, delivering 30 gpm to the distribution systems, which average a little over 1,000 ft. of pipe, 2½-inch to 4-inch, each. Chicago Bridge & Iron Co. "waterspheres" provide the storage at four of the five stations. These are 25,000 gallons capacity, 50 ft. to the bottom. Automatic controls start the pumps when the water level falls 18 ins. below the overflow, stop the pumps when the level is 6 ins. below the overflow, and sound an alarm when the level drops 24 ins. below the overflow.

Feed water for the heating plant boilers is softened in zeolite units; the remainder of the water is not treated. Hydrants are provided for needed hose connections for fire protection. Cottages at the various stations range from two to seven.

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Kansas Uses "Old-Fashioned" Cement

Three paving contracts totaling 23¼ miles of 24-ft. concrete pavement were let by Kansas this spring which called for the use of "old fashioned" coarse-ground cement for ¾ of the length. It was expected that this would secure a tougher and more desirable pavement than would use of finer ground Type 1 cement. Tests of existing pavements have shown that those laid prior to 1930 have a tougher fiber and better soundness than more recent ones. Slabs from pavements 25 yr. old were found to have a modulus of rupture exceeding 1,000 psi, while those from a large number of 8 yr. old pavements had less than 500 psi. In addition to coarse grinding, the cement is limited to a maximum of 42% tricalcium silicate. Additional requirements include a minimum cement factor of 1.60 bbl. per cu. yd.; mechanical tamping; no vibrating; curing by use of moist burlap for 24 hr. followed by 20 days of wet earth curing; contraction joints to be cut with a saw during the curing period; redwood boards instead of fiber expansion joints; and steel rollers for consolidating the concrete and removing laitance. Air entrainment is incorporated on parts of each section.

W. J. Arndt — "Kansas Seeks More Durable Pavements Through Use of 'Old Fashioned' Cements;" Engineering News-Record, June 22.

Maintaining Highway Equipment

The Virginia Dept. of Highways maintains 47,000 miles, of which over 9,000 miles are in the primary system. There are 8 construction and maintenance districts, each with headquarters near the center of the district. Each district has an engineer with an equipment superintendent. Each district is sub-divided into 4 to 6 residencies, each with a resident engineer and mechanic. Each residency includes 2 to 4 counties, each with a county foreman.

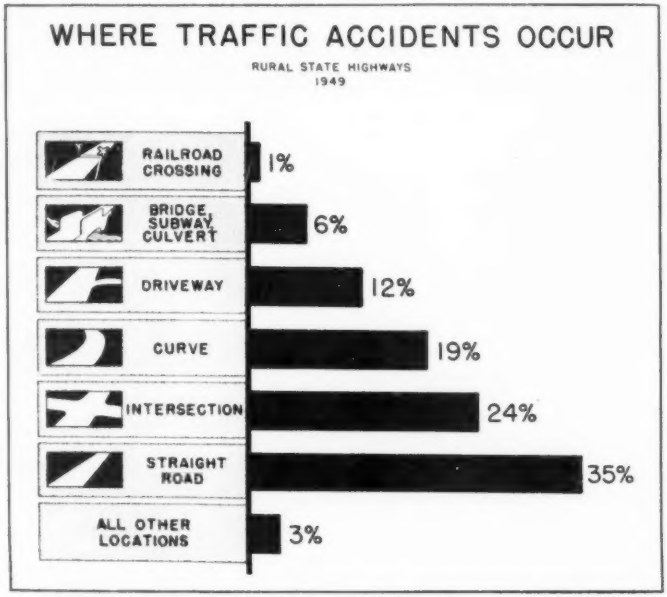
Mechanical forces under the general supervision of the district engineer are primarily concerned with (1) servicing and minor repairs performed by the operators; (2) replacement or repair of major parts beyond the scope of the operators' facilities and knowledge, performed in the resident shops by the resident mechanic and his helper; (3) general overhauling and major repairs, machine work, carpenter work, welding and all work requiring the facilities provided in the district shops. The district shop has equipment overhauling and major repair facilities, and a stock of the major parts and equipment necessary. In Richmond is a central equipment depot which processes and prepares new equipment for the field forces, manufacturing and overhauling equipment that the district shops are not capable of performing.

Each day an operator must see that the equipment, windshield and windows are clean; check gas, radiator water and crankcase oil, tire pressure, windshield wiper, lights, water in battery, horn and brakes, and that chains, tools, fuses, spare bulbs, fire extinguishers, first aid kits, flares and "Men Working" signs are properly stored. Once each week the operator gives his equipment a thorough inspection.

Delemater Davis, Jr.—"Keeping Highway Maintenance Equipment in Condition;" PUBLIC WORKS, July.

Effect of Frost on Carrying Capacity

A Committee appointed by the Highway Research Board to investigate the weakening effect of freezing and thawing on the carrying capacity of highways, reported in 1948 that the loss so caused might be as great as 60%. Study of the subject in several states has continued, and additional data were reported this year. It is found, by comparing the results obtained with 6" and 12" diameter bearing plates, that the carrying capacity of a road is not proportional to the loaded area, but rather to the perimeter of that area. New York conducted tests in the fall of 1948 and spring of 1949 at six locations, testing the surface, base and subgrade of pave-



● *TRAFFIC accidents on Ohio rural state highways in 1949.*

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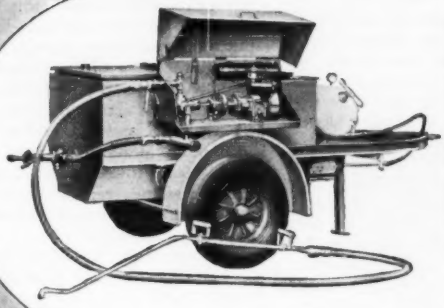

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What makes the 84-HD the outstanding unit for black-top maintenance work is the "Double Heat Circulation" and the "Screened Reservoir", two Littleford patented features. "Double Heat Circulation" System gets the maximum results out of the burner and the "Screened Reservoir" sees to it that there is a continuous flow of materials at all times. The 84-HD has no flues to burn out either—it's sturdy in construction and will outlast kettle after kettle.

Littleford the foremost Kettle manufacturer has made the 84-HD to give long lasting service. The 84-HD can be even more efficient by adding a Hand Spray or Motor Spray Attachment.

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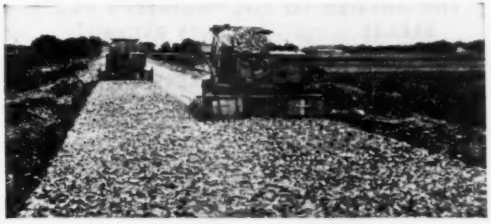
Self-propelled — 4 wheel drive.

Operates entirely on subgrade — no displacement of newly-spread materials. Blends joints.

Lays up to 9" thickness, up to 12½' width, with straightedge accuracy.

All base and surface aggregates, plant-mixed stabilized soil or free-flowing bituminous mixes.



So low in cost you can use two spreaders in tandem to lay full width base, roll in one operation, keep your higher-priced paver busy laying top course — at tremendous saving. Ask for Catalog SPS-9.

"Teams" with this Jaeger Bituminous Paver: Latest type precision machine for all types of bituminous materials — self-adjusting to widths to 12½', automatic leveling, paves flush to curbs, gutters, operates entirely on subgrade or compacted course. Ask for Catalog BP-9.

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ments consisting of 3" bituminous surface on 8" granular base, on a subgrade soil of glacial outwash fine sand with some silt. These showed that the spring values averaged approximately 60% of the fall ones, ranging from 35% to 85%. Minnesota found, during three successive years, that there was a spring loss of about 55%, followed by gradual recovery which did not reach a maximum until late fall.

C. L. Motl — "Report of Committee on Load Carrying Capacity of Roads as Affected by Frost Action;" Research Report No. 10-D of *Highway Research Board.*

Geology for the Highway Department

The Virginia Dept. of Highways has a geological section, the work of which can be classified as 1—location of sources of aggregates, 2—assistance on location and design problems, 3—prevention and control of slides, and 4—bridge foundation investigations. Beginning in 1948, the department has been locating and mapping all sources of suitable aggregates. The materials engineers in the 8 departments, after locating a possible source of aggregate, send samples to the geologist for identification, estimate the amount available, indicate whether the site is adequate for crushing and stock piling and whether water is available for hydraulic stripping. Tests are run for abrasion, specific gravity, resistance to freezing and thawing, and liquid and plastic limits of the material passing the No. 40 sieve. To date, approximately 1/5 of the state has been covered with this survey.

The geological section can aid in solving location and design problems by indicating the nature of the materials to be encountered and presence of zones of crustal weakness or faults; by predicting slopes on which material will stand without slides, and outlining methods of intercepting ground water. The geologist, by study of the dip of the strata, the amount of overburden and the direction of jointing in the rock, can predict with reasonable accuracy the probability of a slide. Where bridges or other structures are to be built, the underground conditions are ascertained by drilling. The Virginia highway department keeps two diamond core-drilling crews busy. The chief of party of each crew is a geologist. This drilling is preferred to the recently developed seismic methods, which may not detect cavities or solution channels in the rock.

W. T. Parrott — "Geology Indispensable Aid to the Highway Engineer;" *Better Roads,* June.

Aluminum for Highway Bridges

Within the past three years there has been a notable increase in activities tending toward the use of aluminum alloys in bridges, but it is not believed that aluminum will supplant steel and concrete as the principal materials of bridge construction. But should steel reach 4 c. a pound and labor $2 an hour, 35-c. aluminum will be found additionally useful. Pure aluminum can not be used for bridges as it yields under a stress of less than 3,000 psi, but with additions of zinc, copper, magnesium and chromium 24 times this strength is possible. The tensile yield of the alloy known as 14S-T6 is closely comparable to that of structural nickel steel, and that of 61S-T6 is slightly higher than that of structural carbon steel. Resilience is three times that of steel, requiring special attention to compression members and providing a

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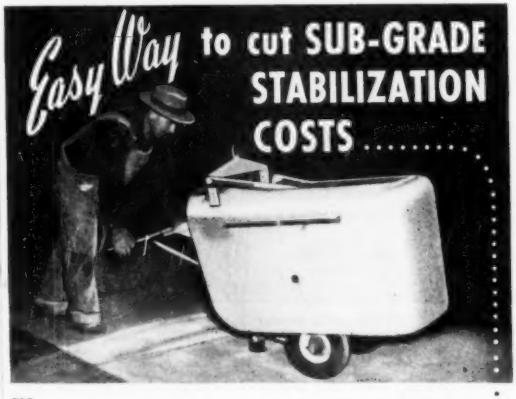

Where pavement, sidewalks, curbs or gutters are beginning to settle, Koehring Mud-Jack is an easy, low-cost answer to your problem. This handy unit pumps inexpensive soil-cement slurry into small holes drilled through slab . . . raises structure to original level . . . leaves firm, lasting sub-grade support.

NO INCONVENIENCE TO PUBLIC . . . no traffic detours necessary. Koehring No. 10 Mud-Jack, illustrated, is ideal for city work . . . portable as a wheelbarrow. Bigger No. 50 Mud-Jack is also available for preventive maintenance or repairs on highways. For complete information write to

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cushion against shock loads and minor foundation misalignment; conditions of repeated loadings require special consideration. High temperatures reduce strength and raise ductility, but both strength and ductility are maintained or rise at sub-zero temperatures. Weight savings of over 50% are effected in small structures, and savings of 75% or more may be possible in long-span or movable bridges. Substantial savings are effected in the cost of maintenance and depreciation arising from atmospheric corrosion.

Riveting is used for making joints; practicable methods of welding, except for architectural features, have not been developed.

B. J. Fletcher—"Aluminum Alloys for Bridges;" *Roads and Construction*, May.

Treating Soil Roads with Calcium Chloride

The Committee on Soils Calcium Chloride Roads, having studied all available information and conducted field experiments, has reached certain conclusions relative to the effect of calcium chloride on compaction, moisture content, density, workability, strength and durability. These are summarized in their report as follows:

The most outstanding, yet interdependent, observations of this field investigation are: the calcium chloride treated soils showed higher strengths; better moisture control—as indicated by reduced moisture fluctuations; reduction of ravelling and potholing that develops prior to surfacing; and a reduction in the friability of noncohesive or nonplastic soils.

The shear strengths, when tested with the Burggraf shear apparatus, indicate that, on the average, strengths are increased about 10 lb. per sq. in. by incorporation of calcium chloride into the soil base. The greatest relative benefits in increased strengths were found in soils of low plasticity or noncohesive soils where shear strengths of the untreated soils were only about 5 lb. per sq. in. The addition of calcium chloride increased the strength to 10 lb. per sq. in., or double the original strength.

In somewhat better soils the shear strengths of the untreated materials (10 lb. per sq. in.) were also doubled by the incorporation of the calcium chloride. Untreated soils with strengths of about 50 lb. per sq. in. did not double in strength by the use of calcium chloride, but they did

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- The Netco Unit can be removed from truck and chassis in 30 minutes.
- The Netco can be operated continuously because the material removed from catch basins is loaded into other trucks. This unit will average 20 to 30 catch basins per 8 hour day.
- The Netco Bucket closes pneumatically, assuring positive and maximum digging efficiency.
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attain the 10 lb. per sq. in. advantage.

One of the projects, consisting of untreated crushed limestone base material, showed a strength of 65 lb. per sq. in. The corresponding calcium chloride treated section showed a strength of 80 lb. per sq. in.—an increase of 15 lb. per sq. in. All untreated bases showed a tendency to fail in shear at lower deformations than the treated bases by indicating greater friability, less moisture or both.

In moisture control, or reduction in moisture fluctuations, the sections treated with calcium chloride have maintained better uniformity. One project, while being carried as an open surface, was observed for moisture fluctuations from rain storms. The treated soils showed pronounced uniformity of moisture content and ability to shed water effectively.

This same project also showed the relationship of potholing. At the end of two months following construction, the untreated section had 52 potholes per 110 feet of its length. The treated sections had no more than 10 potholes for the same lengths. At the end of the third month, the untreated section was a mass of potholes, but each treated section had no more than 23 potholes for their 110-ft. lengths.

"Progress Report of Committee on Soils Calcium Chloride Roads;" *Highway Research Abstracts,* June.

Asphalt-Soil In Oklahoma

The Oklahoma state highway department has used asphalt-soil stabilization for several years. Proper soils are plentiful, the country is comparatively arid, the type has proved to be economically sound, and provides a good foundation for asphaltic surface if needed later. Their experience indicates that the soil should contain at least 50% of sand but those composed almost entirely of sand are difficult to compact; about 75% sand is most desirable. Medium-cure-type of cutback asphalt is the most economical. Pulverization and blending are of primary importance. A research conducted by the division of engineering of Oklahoma A & M College found that a very low volatile content in the finished mix is best; a liquid asphalt between the present RC and MC specifications is desirable. The state bases the design thickness on the average of Housel and Klinger formulas, with CBR used as a base factor; limited to 8" to facilitate construction. Where required, additional support is built into the subgrade by use of high-bearing-value selected soils. The suitability of soil for stabilization and selection of liquid asphalt content necessary are determined by the Hubbard field stability test. Selection of the asphalt content required consists in balancing a loss in stability against a gain in waterproofing as indicated by a decrease in water absorption.

"Asphalt-Soil Stabilization in Oklahoma;" Roads and Streets, June.

Bituminous Surfacing In Tropical Climates

Tropical heat, long dry seasons and the very bright sunlight have rapid detrimental effects on tar and asphalt surfaces. Tar should never be left on the surface exposed to the atmosphere. Open-texture surfaces should be avoided—non-skid properties should be obtained by other means. In spray and carpet construction, avoid penetration of the binder into the fabric of the roadway, as its distribution is to some

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extent uncontrolled and pockets of excessive binder cause defects and the surface does not receive the amount of binder calculated to be necessary. When both tar and asphalt are available, use tar for the first coat and asphalt for the wearing surface. Road surfacing materials should receive maximum penetration at a central plant, particularly where the surfacing is done by ignorant, inexperienced and careless native labor. A uniform distribution of the proper amount of binder is more important in the tropics than in temperate climates.

William Livingston — "Colonial Roads;" *The Surveyor*, May 26 & June 2.

"Zebra" Crossings In England

In our *Highway Digest* for September 1949 we described and illustrated a "Zebra" type of markings for pedestrian crossings which were being tried in England. A study of the effect of these on both pedestrian and vehicle performance, and also the effect of propaganda during a "Pedestrian Crossing Week," was conducted by the Road Research Laboratory. Fifty crossings in England and Wales were studied, 25 with and 25 without "Zebra" markings, for 5 weeks before Pedestrian Crossing Week and for 8 months following it.

The following conclusions are drawn from the study:—

(1) There was a marked improvement in the respect paid by pedestrians to pedestrian crossings as a result of the week of propaganda.

(2) This improvement was much more marked, more consistent and more lasting at those crossings which had "zebra" stripes than those which had not.

(3) A detailed examination of the results for the first three weeks at the 50 crossings shows that on the standard of behavior used, 65 per cent of children, 49 per cent of women and 39 per cent of men used the pedestrian crossings in a "satisfactory" way. This confirms the results of previous experiments, which indicate that children pay more attention to pedestrian crossings than adults.

(4) The detailed examination also showed that in small towns propaganda had a greater effect on pedestrian behavior than in big towns.

(5) Pedestrian Crossing Week produced a marked improvement in the respect paid by drivers to pedestrian crossings.

(6) The improvement in driver behavior at the "zebra" crossings, whether reckoned as a proportional increase in drivers "giving way" or as a simple difference, was greater at the "zebra"-marked crossings than at the plain crossings, and was more permanent.

"Influence of the Zebra Marking and of Propaganda on Behavior at Pedestrian Crossings;" *The Surveyor*, June 23.

Effects of Compactors On Different Types of Soils

Investigations conducted by the Road Research Laboratory of Great Britain on the effects of smooth-wheel rollers, pneumatic tire rollers, club-foot sheepsfoot roller, tapered foot roller, and a "frog" rammer, on five types of soil—heavy clay, medium clay, clay loam, non-plastic sand, and non-plastic gravel-sand-clay, showed that:

(a) On the cohesive soils the sheepsfoot rollers gave the highest dry densities and lowest optimum moisture contents and the pneumatic tired rollers gave the highest optimum moisture contents.

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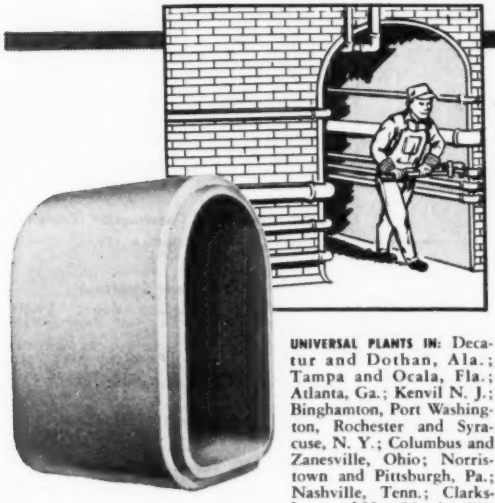

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(b) On the cohesionless soils there was little variation in optimum moisture content for different equipment the smooth wheel rollers giving the highest density.

(c) It was found that a given density will be reached with the fewest number of passes at the higher end of the moisture range.

(d) There was a limit to the compaction that could be obtained for any type of equipment. The number of passes beyond a certain limit had little effect on density. Generally this value ranged from 24 to 32 passes for sheepsfoot rollers, 4 to 8 for pneumatic and about 8 for smooth wheel type.

The author concluded that, in general, smooth wheeled rollers are best suited to crushed rock, or mechanically stable gravels and sands; pneumatic tired rollers to closely graded sands and fine grained cohesive soils at moisture contents approaching their plastic limits; and, sheepsfoot rollers to fine grained cohesive soils at moisture contents of 7 to 12 percent below their plastic limits.

"Compaction of Soils"; *Highway Research Abstracts*, February.

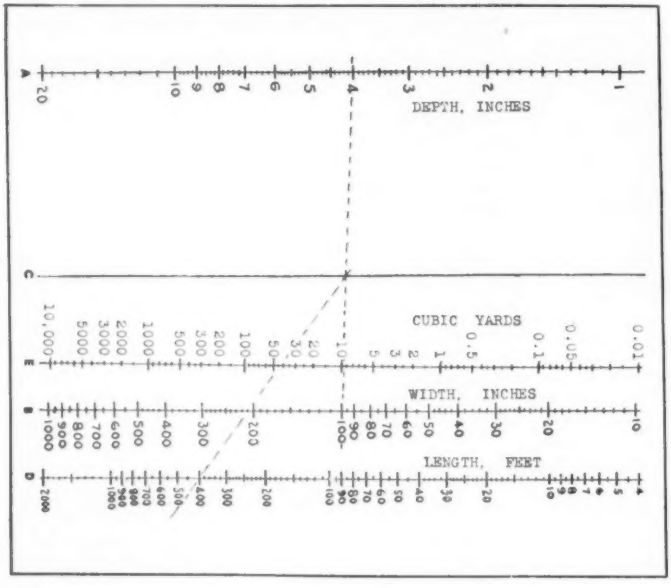
How Many Cubic Yards of Concrete?

W. F. SCHAPHORST, M.E.

This simple chart makes it easy to find the number of cubic yards of concrete required for any depth of walk, road, or what not. It does away with pencil figuring entirely.

For example, if you want to build a walk 4 inches deep, 100 inches wide, and 400 ft. long, the dotted lines drawn across the chart show how it is done. Connect the 4-inch depth, column A, with the 100-inch width, column B, and locate the intersections with column C. Then from that point of intersection run through the 400 ft. length, column D. The answer is immediately given in column E as about 41 cubic yards.

But that isn't all. The chart is applicable to any dimensions. Thus for example if the depth is 40 inches instead of 4 inches, merely add one cipher to the answer in column E and you will have 410 cubic yards. The same dotted lines can be used to find the answer. And again, if the depth is 40 inches and the width 1,000 inches, the answer becomes 4,100 cubic yards by adding two ciphers. In other words, if it is necessary to add ciphers in column A, B, and D, the total of those added ciphers must be added to the answer in column E. However, the chart is broad enough to cover most concrete jobs without the necessity of ever adding any ciphers.



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Waterproof Sidewalks. By *Royal W. Thompson*, Dir. of Pub. Works, Hartford, Conn. July, Pp. 67-68.

New Highway Tunnel is the South's Largest. (Houston, Tex.). July, Pp. 72-73.

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Geology-Indispensable Aid to the Highway Engineer. By *W. T. Parrott*, Eng. Geologist, Va. Dept. of Highways. June, Pp. 19-21, 40.

Park-to-Park Highway Built Over Rough Mountain Country. By *E. G. Middleton*, Res. Engr., U.S.B.P.R. June, Pp. 22-24.

Testing Will Improve County Work. By *Clyde V. Jones*, Dep. Road Com'r., Calif. June, Pp. 25-26, 39.

Will Black-Topping Reduce Upkeep? Forum answers by 8 highway officials. June, Pp. 31-33, 40.

Build Bridges and Culverts for Longer Life. By *Sam. Steigerwalt*, County Engr., Story Co., Iowa. June, Pp. 35-36.

California Highways

Fluorescent Highway Intersection Lighting. By *F. M. Carter*, Sr. H'way Engr., and *Roy W. Matthews*, Assoc. Elect. Engr., Calif. State H'ways. June, Pp. 33, 50, 63.

Erosion Control. By *H. Dana Bowers*, Landscape Arch. June, Pp. 34-40, 64.

New Cement-Treated Base Road-Mixed Method. By *H. W. Benedict*, Asst. H'way Engr. June, Pp. 46-48.

Construction Methods and Equipment

Preventive Maintenance of Cranes and Shovels, by *J. L. Beltz*, Thew Shovel Co. Of Rock Drills, by *Theodore Slager*, Jr., Ingersoll-Rand Co. Of Big Equipment Tires, by *Frank W. Fox*, Goodyear Tire & Rubber Co. Small Air Tools, by *A. G. Ringer*, Ingersoll-Rand Co. Of Concrete Pavers, by *A. E. Miller*, Chain Belt Co. Of Air Compressors, by *J. E. O'Rourke*, Chicago Pneumatic Tool Co. Of Motor Scrapers, by *A. W. Schmidt*, LaPlant-Choate Co. July, Pp. 58-102.

Engineering News-Record

Kansas Seeks More Durable Pavements Through Use of "Old-Fashioned" Cements. By *W. J. Arndt*, Asst. Eng'r., Kansas State H'way Com'n. June 22, Pp. 34-37.

Public Works

Repairing the Missionary Ridge Tunnel. By *L. P. Hoge*, Res. Engr., Tenn. State H'way Dept. July, Pp. 34-35.

Keeping Highway Maintenance Equipment in Condition. By *Dalemater Davis*, Jr., H'way Equipment Engr., Va. Dept. of H'ways. July, Pp. 40-42.

Reclaiming an Old Oiled Road. By *Carl Lemmer*, Surveyor, Cascade Co., Mont. July, P. 42.

How Equipment Is Used Effectively in County Highway Work. July, Pp. 46-47.

Geological Surveys Aid in Highway Design and Location. By *J. L. Stuckey*. July, Pp. 68-69.

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Some Aspects of Skidding. By *C. Greville Smith*. June, Pp. 168-172.

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The Road Contractor's Modern Departmentalized Overhauling and Repair Depot. By *V. N. Holderman*, June, Pp 33-37.

Low-Cost Concrete Bridges in Burleson Co., Tex. By *Frank W. Perrin*, Co. Engr. June, Pp. 39-40, 42.

Hot Mix Asphaltic Paving with Caliche-Sand Aggregate. By *E. O. Beatie*, Texas Co. June, Pp. 81-83.

Asphalt-Soil Stabilization in Oklahoma. June, Pp. 65-66, 68, 70, 72, 74, 76.

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Colonial Roads. By *Wm. Livingston*. June 2, Pp. 319-320.

Influence of the "Zebra" Marking and of Propaganda on Behavior at Pedestrian Crossings. June 23, Pp. 365-366.

PUBLIC WORKS DIGESTS

THE WATER WORKS DIGEST

Special Service Charges

The Durham, N. C., water department adds very materially to its income by charging for all services rendered in addition to the regular water rates. It operates the sewage system and charges for this 25% of the water bill, yielding a little over $100,000 a year. For water and fire protection outside the city limits it charges twice as much as for customers inside, a difference of $31,300 in 1948. It charged the city $6,400 for water used other than at schools; $32,400 for fire hydrants; $22,600 for fire protection for industries; and received $9,256 boating and fishing revenue. It charges $50 for tapping the main and laying a ¾" service; more for larger services.

D. M. Williams — "Special Service Charges:" *Journal American Water Works Ass'n*, June.

Prestressed Reservoir For Milwaukee, Oregon

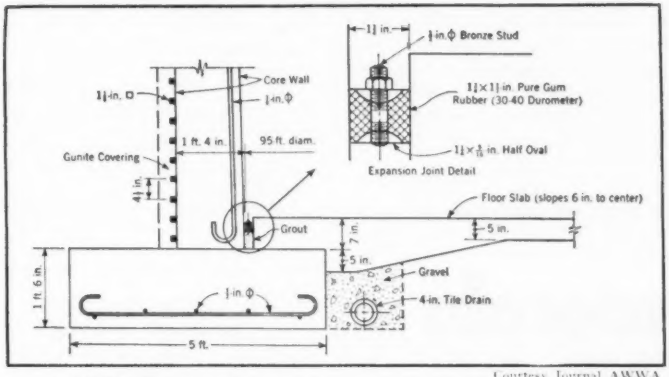
In September 1949 Milwaukee, Oregon, placed in service a 1.5 mg prestressed concrete reservoir which cost $65,000. The prestressing was effected by means of 1⅛" and 1" square steel bars with ultimate strength of 85,000 psi. The foundation was poured as a separate ring on which the wall rests, and was coated with asphalt to prevent bond between wall and foundation. The floor slab is not tied to the foundation, but a shear shoulder tends to prevent relative horizontal motion between the two. A watertight joint between the wall and the floor slab is obtained by employing a rubber water stop. This consists of a 1¾ x 1½" ring of pure gum rubber placed between the slab and the wall and compressed by half-oval steel strips pressed against its top and bottom faces by bolts which draw them together and thus force the rubber to expand horizontally. The wall was poured in 8 sections, with galvanized sheet metal water stops in the vertical joints. The dome roof was poured as a monolith in 8 hours. After it had cured for 21 days, prestressing bars were tightened up to 31,000 psi, during which the dome rose at its center 3/16" above its original position.

H. Loren Thompson and Leonard Cross — "Prestressed Concrete Reservoir for Milwaukee, Oregon;" *Journal American Water Works Ass'n*, June.

Rehabilitation of an Army Post Supply

The author describes the difficulties encountered in providing water for an army post in an arid area under rapid and unanticipated expansion under war conditions. Built in 1940 as an emergency landing strip it was supplied by two wells delivering about 200 gpm. It was expanded in 1942 and in 1944 to accommodate 4600 military and 1,000 civilian personnel. Additional wells were drilled, but the water problem became acute. The estimated demand due to personnel was estimated to be 473,000 gpd, and there were also two swimming pools filled twice weekly, 260 evaporative air conditioners, and the washing of planes, which required about 50,000 gpd additional. It was found that there was little loss from the distribution system, but faucets were leaking, automatically flushed urinals running continuously, the swimming pools leaked 83,000 gpd, and 20,000 gpd was used for irrigating for dust control. The swimming pools were repaired and the water recirculated and chlorinated; water for the coolers was recirculated; manually operated valves placed on the urinals; irrigation controlled and practiced at night; cooling water for the pumping engines was recirculated back into the wells. The well capacities and pumps were studied. One 250 gpm deep well turbine was operating on a well with a safe capacity of only 196 gpm; and conditions were improved by removing one stage from the pump. In another well the safe yield was much greater than the pump capacity and this was increased. A schedule was prepared for operating the pumps in rotation in 8 hr. shifts. With these changes it was possible to provide 1,052,000 gpd., which was ample for the controlled use.

N. W. Nester — "Curing Water Supply Difficulties at a Wartime Army Post;" *PUBLIC WORKS*, July.



Courtesy Journal AWWA

● ***JUNCTURE of slab and core wall of prestressed reservoir.***

Metallizing an Old Water Tank

A 65,000-gal. wash-water tank at Dunkirk, N. Y. was found to contain hundreds of long, deep pits, some more than 0.25" deep. It was made "as good as new" by metallizing. After sand-blasting the interior, the deep pits were filled and loose rivets and lapped seams welded by the electric arc method, and the entire inner surface then was coated with 0.01" of zinc. Twice during the work it was necessary to wash filters and the work was discontinued, the tank filled, and emptied again after the

filters had been washed. The welding work took about two weeks. Just before metallizing an area, it was sandblasted with angular steel grit at 100 psi, which produced a very irregular texture that served to anchor the sprayed metal. The zinc coating was applied in four or more layers, each applied at right angles to the one immediately preceding. The total thickness of zinc was tested with an electric gauge, and any spot under 0.008" was given another coat. Sprayed metal protection for elevated water tanks costs from $1.40 to $1.65 per sq. ft.; for tanks on the ground the cost may be as low as 50¢.

John E. Wakefield — "Metallizing Makes an Old Water Tank Like New;" *Engineering News-Record*, July 6.

Repairing Leaky Mains

Revitalizing the old water works of New London, Conn., involved raising the head 110 ft. on 100 miles of existing transmission and distribution mains. As soon as the new pressure was turned on it caused three breaks in a transmission main and two in the distribution mains. These were repaired and the high pressure again applied but to only a few blocks at a time, each additional section developing one or more leaks. Main breaks continued for about a year and a half. Replacing one main that showed an old split from bell to spigot resulted in threat by a farmer a mile away to sue for destroying a brook that had been running through his farm for as long as he could remember. (He did not sue). An unusual repair was made in 5,000 ft. of 16" wood-stave gravity pipe line 20 yr. old. The ground was frozen and excavation very difficult, and a 20-ft. length of the top of the pipe was cut out at intervals of about 100 ft. 12" cement-asbestos pipe was placed in each opening, each length joined to the preceding one as the line was pulled through the old pipe to the next opening.

Kenneth H. Holmes — "Revitalizing Old Water Systems;" *Journal New England Water Works Ass'n*, June.

Removal of Iron and Manganese

The author describes pilot plant experiments to test the efficiency of the Spaulding precipitator and sludge blanket for the removal of iron and manganese from the well water supply of Lowell, Mass. This water contained 4.4 ppm of iron, 0.8 ppm manganese, and a pH of 6.3. Alum and lime were used as coagulants. The following conclusions were drawn:

(1) The use of the precipitator relieves the sand filters of the tremendous load of work they carry in iron-removal plants of the aeration, sedimentation and filtration type. Approximately 95% of the iron and manganese is removed by the precipitator when proper pH is maintained.

(2) The iron and manganese which remains in the precipitator effluent is tied up with the small amount of floc which passes through the precipitator. This floc is removed on the filter surface and does not penetrate, as do the iron compounds which result from aeration. The result of this is that the frequency of filter cleaning will be considerably reduced.

(3) The control of pH is very important, the optimum zone of operation being between pH 8.5 and pH 9.1 for the water tested.

(4) The chemical savings result-

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ing from the use of the precipitator are very large, as compared with conventional dosing and settling.

(5) Because the detention period of a precipitator is from 1 to 1.5 hours, the cost of construction of the smaller tank, as compared with conventional settling basins, will be much less.

(6) Comparisons between the pilot-plant results and jar tests show that conventional chemical precipitation was much less efficient for iron and manganese removal than was the precipitator.

R. B. Babcock — "Iron and Manganese Removal in the Spaulding Precipitator;" *Journal of New England Water Works Ass'n*, June.

Effect on Water of Cement-Asbestos Pipe

In an effort to learn what, if any, effect cement-asbestos pipe has on the water passing through it, samples of water in five Vermont systems that used this pipe in parts of their distribution systems were studied, comparison being made of the pH, hardness and total alkalinity of samples taken at the beginning of this pipe and at distances one or more miles further on the same line. The studies were made in 1945, 1946 and 1949. The pipes had been in service 1 to 13 yrs. In most cases there was an increase in each of these characteristics, which was greater at dead ends than in the central parts of the system. The increase was less at each test than at that of the one 1 to 4 yr. previous. The hardness in one line installed in 1936 was 54 at all points in 1945, but in 1949 was 46 at the beginning of the pipe, 50 after 1.1 mi. of flow, and 74 at a dead end 0.8 mi. further. In another line installed in 1941, the hardness in 1945 increased from 30 to 48 in flowing through 1.5 mi.; but in 1949 it decreased from 46 to 40 in the same section. At a dead end in the latter system the hardness was 57 in 1945 and 42 in 1949. It appeared that the most recently laid pipe produced much less increase than that of previous years. This was explained by a representative of Johns-Manville Co. who said that recently they have used an admixture of silica in the manufacture of their pipe and obtained more insoluble calcium silica. It was also pointed out that the highest hardness found was 74 (it was 54 where it entered the asbestos pipe) which is much less than the normal water in the Great Lakes; and that there had been no consumer complaint of hardness in any of the cities.

Edward L. Tracy — "Observations on Water Samples from Cement-Asbestos Pipe Systems in Vermont;" *Journal of New England Water Works Ass'n.*, June.

Atomic Wastes and Water Quality

No absolute tolerance level can be fixed for radiation in water which will apply to all of the many different forms of radiation. It is hard to see how an atom bomb attack could result in enough radioactivity in a water supply to add much to the misery and suffering caused by the other effects. After an attack, restoring pump facilities and repairing mains should be the first consideration, with radioactivity as a minor worry. Some experiments indicate that 80-90% of most forms of radioactivity would be removed by ordinary water purification methods, and the remaining amount would be less than that in some normal supplies. Of more immediate interest is the treatment of wastes, particularly liquid wastes, produced in more prosaic ways. The difficulty of puri-

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fying these is a problem to which not all the answers have been found.

W. A. Rodger — "Atomic Wastes and Water Quality;" *Journal American Water Works Ass'n*, June.

In the matter of decontamination of water supplies, should they become accidentally contaminated by a spill or as a result of military action in which radioactive materials were used, much attention has been given to the problem with which a water utility so affected would be faced. It is known that radioactive materials become readily attached to soils and vegetation. This phenomenon itself has great possibilities in decontamination, although its positive effects and limitations are not fully understood.

Those water-works which have no treatment facilities for removing dissolved and suspended matter from water would be subject to the greatest hazard, although the factor of dilution would be helpful. Even the protection of attachment of radioactivity to the bottom of reservoirs would be rendered ineffective during periods when the seasonal turnover of the reservoir occurred or when, for other reasons such as a high wind, the equilibrium of the water in the reservoir was disturbed. Where chemical coagulants are used, followed by mixing, flocculation and settling, a substantial percentage removal of radioactivity can be brought about. In such cases, if the contaminant is a long-lived radioactive substance, the settled sludge presents a problem. If settling-basin sludge or wash water is released to a stream or waterway as is customary, a concentrated "slug" of radiation would result, decreasing in activity as dilution in the stream took place. Some storage facility, such as a basin or a lagoon, would be required and provision should be made to monitor it, as well as the pumps and piping used in the transfer of the sludge or wash water.

There are possibilities of using radiation as a research tool in the water-works industry. Already in the oil industry wells are being logged by radiological methods, using neutrons and gamma rays. The absorption of radioactivity by plankton, algae and other biological forms of life common to water opens another avenue of interest to the water-works operator whose troubles with these organisms are of serious nature. The use of radioactive-tracer techniques offers a real opportunity to study the phenomena of flocculation, coagulation and settling. What goes on in rapid and slow sand filters and the phenomenon of ion exchange should be traceable by means of radioactive isotopes. Other possibilities are: the flow of water in pipes; the causes and effects of corrosion; studies of joint compounds and their use, and perhaps the mechanism by which chlorine acts as a germicide. It is reported that in France a research worker has developed a proton microscope, which gives magnification six times that of the electron microscope.

Arthur E. Gorman — "Mutual Interests Between the Waterworks and Atomic Energy Industries;" *Journal of the New England Water Works Ass'n*, June.

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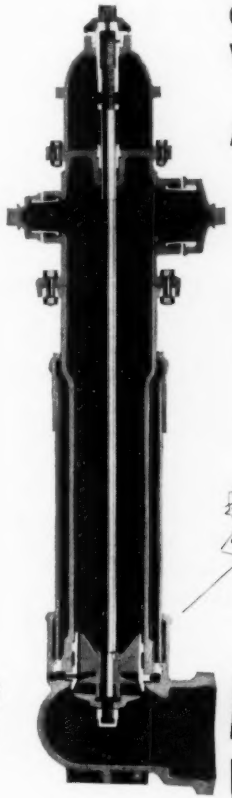

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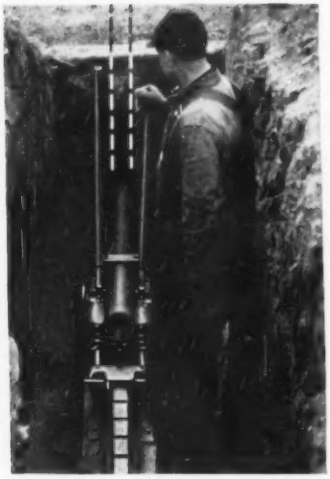

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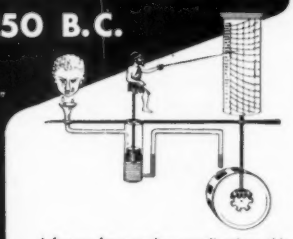

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Sewerage of Baton Rouge

Baton Rouge, La., in 1949, by extending its area from 3,000 acres to 19,000 acres, increased its population from 36,000 to over 100,000. One of the results was the necessity of enlarging the sewerage system. This has just been completed at a cost of $6,250,000. The cost was financed by general obligation bonds for about 40% of the total cost and revenue bonds for the remainder. The former are to be paid off by a special tax levied on property. The revenue bonds are to be paid off by revenue service charges of $10 per quarter for a single family residence, graduated up to $50 for a ten-family unit, and $20 for each commercial unit.. A discount of 25% is allowed on bills paid within 15 days.

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In District No. 6 are 8 pumping stations and 18,000 ft. of ci. force mains. Part of the sewage is pumped three times before it reaches the main pumping station, which has a capacity of 20,000 gpm. From the main pump station, the sewage is pumped through 5,000 ft. of 36" ci. pipe into the river. One of the force mains crosses a lake with 2,160 ft. of 30" doublex-simplex joint pipe. An unusual feature of this crossing was the presence of 50 tree stumps on the 10-ft. wide strip that was cleared for the pipe by use of a dragline resting on a floating barge.

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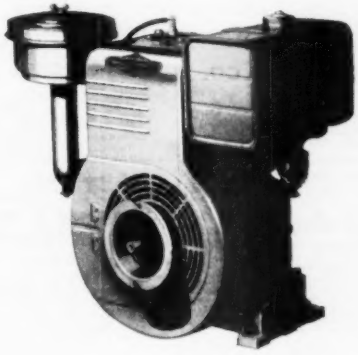

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Modified Primary Sewage Treatment

(*Continued from page* 39)

connect to the influent channels of the individual settling tanks.

In order to obtain even distribution, the sewage in each tank will flow through four large ports and against inlet baffles which are perforated with numerous 2-inch holes.

There are to be three settling tanks, each 212 feet long and 33 feet wide with a water depth of 10 feet. These tanks will provide about 2½ hours detention at 15 mgd average flow. Each will be equipped with Chain Belt sludge collecting mechanism with two longitudinal and one cross collector, driven by a single ½-hp motor. The collected sludge is carried through 8-inch cast iron pipes to the plunger pumps.

Scum troughs of the manually operated, revolving type will be provided.

Provisions for Chlorination

The chlorination building, with attached garage and repair shop, will be located at the far end of the plant beyond the settling tanks. Two Automatic Master (Wallace & Tiernan) chlorinators, each with a capacity of 2,000 lbs. per day, will be available for pre-chlorination at the pumping station, as previously mentioned, and also for post chlorination. Chlorine dosage may be automatically proportioned by the flow.

The effluent from the three settling tanks will flow through a 36-inch Parshall flume and then enter the main outfall sewer. This continues on about one-half mile further down the valley and empties into the Naugatuck River immediately below Platt's Mill dam. Sufficient chlorine contact time will be provided in the outfall sewer.

Sludge Filter Building

This is the largest building in the plant, 90 x 50-feet in its maximum dimensions.

There will be three Carter duplex plunger pumps with a capacity of 140 gpm against a total head of 30 feet—two will have 5-hp direct drive motors and the other a 5-hp variable speed transmission. Also a Chicago Scru-Peller type recirculating pump with 7½-hp motor and a capacity of 350 gpm against a total head of 36 feet. Duplicate installations of 25-gpm and 150-gpm sump pumps will be provided for building drainage.

Sludge will normally be pumped to either of two tanks, each with a capacity of 50,000 gallons. These, located in the Sludge Storage Building will also serve to store the night and week-end withdrawals of sludge from the settling tanks and to concentrate the sludge prior to vacuum filtration.

The sludge storage tanks will feed by gravity to a sludge well from which a bucket elevator will deliver it to the conditioning tank. Trial laboratory runs on raw sludge indicate that proper conditioning will require approximately 6% lime and 1% ferric chloride. Standard Omega equipment for feeding from 5 to 500 pounds per hour of hydrated or granular washed lime will be provided.

The ferric chloride dissolving tank will be constructed of a 4-foot length of 48" reinforced concrete culvert pipe. The ferric chloride feeder will be of the Omega precision volumetric type, and will feed from a 400-gallon, rubber lined steel tank.

From the conditioning tank the sludge is fed to two Eimco vacuum filters of the continuous, rotary drum type. Each filter will be equipped with a standard swing type agitator. Other auxiliary equipment includes two vacuum pumps, each capable of handling 380 cfm of air at a vacuum of 22 inches of mercury; two 1-hp Nash filtrate pumps; two Roots-Connersville 1-hp blowers; and a Builders-Providence weighometer.

The filter will discharge sludge cake to a horizontal conveyor which is arranged to permit delivery to the sludge mixer of the flash drying equipment or to an inclined conveyor extending to a storage hopper, for direct disposal.

Sludge Drying Equipment

To process the sludge which is to be dried for incineration or used as powdered fertilizer, Combustion Engineering-Superheater flash drying equipment will be used. This will be designed to dry 3,900 pounds of Primary sludge filter cake per hour at 70% moisture. The adjacent refuse Nichols incinerator will supply hot gas at temperatures in excess of 1,000 degrees F.

Other equipment includes a mixer, cage mill, dried sludge cyclone, vapor fan, fertilizer cyclone and bin, screw conveyor and the necessary ducts and accessories. The vapor fan discharges into the nearest incinerator combustion chamber.

For sludge to be incinerated, a 50-foot screw conveyor with two

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15-foot lateral conveyors, dsicharges into the furnace chambers.

Another large unit which is being built simultaneously but under a separate contract, will house two mechanically stoked incinerators, each with a capacity of 150 tons per 24 hours. This structure is adjacent to the sludge filter building. The incinerators, in addition to supplying heat to the flash dryer as mentioned above, will also heat all treatment plant buildings.

Full advantage was taken of the natural terrain to plan the road at the rear of this building, so that trucks may dump refuse and garbage directly into the refuse pit. From the pit the waste material will be picked up by a grab bucket and deposited into the charging hoppers.

The ash pits will be cleaned mechanically by a submerged ash conveyor removal system which will hoist the ashes into a hopper for direct disposal.

Conclusion and Costs

Judging from articles appearing in newspapers and magazines, there is constant pressure upon the State Department of Health to have it force a cleanup of all polluted streams in the State. Although the Naugatuck River seems destined to be the main drain for this populous industrial valley, and unlikely to be restored to its original condition as a potable stream, most of the objectionable features which now exist can be remedied by proper treatment of the wastes at their sources.

Most certainly the treatment of all this City's domestic wastes will effect a radical and most welcome improvement in the sanitary conditions along the scenic Naugatuck Valley. It will be a highly important milestone in the progress of Waterbury.

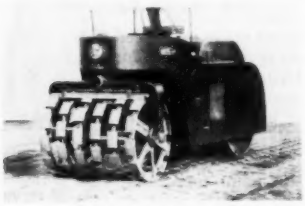
The plant was designed and specifications prepared by Malcolm Pirnie Engineers, Consultants of New York. All work was under the direction of Henry C. Whitlock, City Engineer, with immediate supervision by Walter M. Kunsch, Sanitary Engineer. The contractor was The F. H. McGraw & Co., Hartford, Conn. The estimated cost of the sewage treatment plant was $850,000, and of the incinerator, $400,000.

When you need special information—consult READERS' SERVICE DEPT. on pages 85-89.

PUBLIC WORKS Equipment News

Tandem with Segmented Guide Roll

Buffalo-Springfield tandem rollers in the 8-ton to 15-ton class may now be equipped with a new



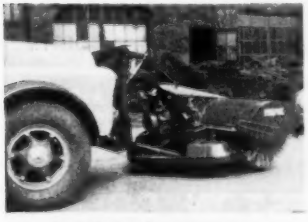
New-type roller

type of segmented guide roll, which is said to give better compaction results than is obtainable with a sheepsfoot roller. The illustration shows the type of construction. Recent tests on loose materials in fills and on stabilized base courses have shown very satisfactory compaction throughout the entire depth of material, so that subsequent treatment and rolling of uncompacted top layers of material is not necessary. Full data from Buffalo-Springfield Roller Co., Springfield, O., or by using the coupon.

Use coupon on page 85; circle No. 8-1

Roto-Broom for Street Sweeping and Road Building

The Frink Roto-Broom, with a number of improvements, is again in production, and available for street sweeping and for road building and road maintenance work. Also, it is valuable for removing snow from streets and intersections. Improvements over the pre-war unit include greater power and molded-on solid rubber tires. This broom is hooked to a motor truck for use. Full data from Frink Sno-Plows, Inc., Clayton, New York, or by using the coupon.



Roto-Broom has many uses

Use coupon on page 85; circle No. 8-2

Sand Rammer and Backfill Tamper

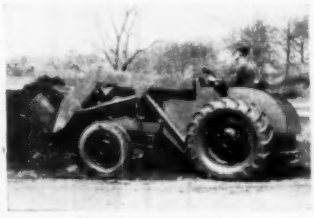
Weighing only 34 pounds, this heavy duty sand rammer and backfill tamper can be used in many ways. It delivers 550 blows per minute, and is suitable for trench tamping, filling around piers, footings and foundations, and similar work. The backfilling butt is 5¾ ins. Ask for M-711 Folder, Master Pneumatic Tool Co., Orwell, Ohio, or use the coupon.

Light backfill tamper

Use coupon on page 85; circle No. 8-3

Loading Without Moving Tractor

This front-end loader will load the shovel without moving the tractor; a 42-inch forward sweep is available, with a bucket 0.8 cu. yd. capacity and 46 ins. wide. It will dig 15 ins. below wheel level, and will load up to 7 ft. high. Dual hydraulic shovel controls. Loads efficiently from any stockpile. Ask for folder from Lessmann Mfg. Co., Des Moines 4, Iowa, or use the coupon.

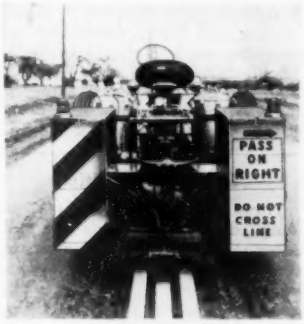


New Lessman loader

Use coupon on page 85; circle No. 8-4

Self-Propelled, Large Capacity Traffic Marker

A tractor-mounted, two-man operated traffic marker, which is 5 ft. 8 ins. wide, will lay traffic lines of different colors and with widths from 3 to 8 ins. It is assembled from nationally known paint guns, tanks, valves, gauges and air compressors. Write for information to Gledhill Road Machinery Co., Galion, O., or use the coupon.



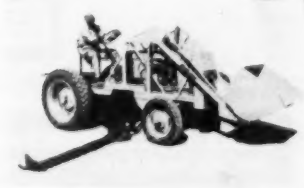
Paints 3 traffic lines

Use coupon on page 85; circle No. 8-5

Shoveloaders to Mount with Mowers

These shoveloaders are designed to mount on Case and Minneapolis-Moline tractors equipped with mowers, and the mounting is such that either unit can operate independently of the other and neither needs to be removed when the other is being used. There are two models with ⅜-yd. and ½-yd. buckets. Full data from Lull Mfg. Co., Minneapolis, Minn., or by using the coupon.

Usea coupon on page 85; circle No. 8-6



Tractor—shovel—mower

Tailgate Loader for Pickup Trucks

This tailgate loader, which has a lifting capacity of 1,000 pounds, can be installed on most pickup trucks. One handy control lifts or lowers the tailgate. Not only does this permit one man to handle heavy loads, but

Truck tailgate loader

it reduces the delays due to manual loading and lifting. Installation and operation are both simple. Write National Lift Co., Dept. 2093, 225 Madison St., Waukesha, Wisc., for information, or use the coupon.

Use coupon on page 85; circle No. 8-7

Back Rip Scarifiers

These back rip scarifiers are mounted on the back side of a bulldozer moldboard. They float on top of the ground when moving forward, but rip up the ground when the tractor backs up. Dead head time

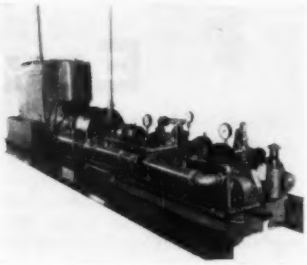
Back rip scarifiers

is fully utilized, and the equipment does not interfere with blading operations, though it does aid in moving more dirt. Information from any Caterpillar dealer, from Preco, Inc., 6300 East Slauson Ave., Los Angeles 22, Calif., or by using the coupon.

Use coupon on page 85; circle No. 8-8

Making Asphalt Emulsions On The Job

Portable units are available in capacities from 500 gallons per hour to 6,000 gph for making asphalt emulsions on the job. These plants are complete; they are available with portable mountings or with skid mountings for carriage on motor trucks. Complete formulas are supplied to enable the purchaser to manufacture all of the emulsions specified by the AASHO. These plants eliminate the need for large storage tanks and permit emulsion



On-the-Job Emulsifier

to be made as needed. For full data write K. E. McConnaughey, 543 Fifth Ave., New York 17, N. Y., or use the coupon.

Use coupon on page 85; circle No. 8-9

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A paint type insecticide which is said to have potency to kill DDT-immune insects has been developed. This is available in customary colors and has the same characteristics as flat oil base paint. It will control, it is said, flies, cockroaches, mos-

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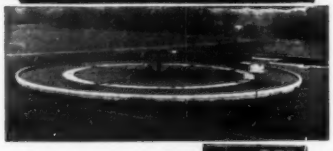

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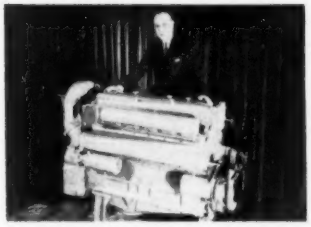
quitoes, bedbugs and numerous other insects. Information from Insecticide Paint Co., 318 S. Washington St., Peoria, Ill., or by using the coupon.

Use coupon on page 85; circle No. 8-10

Compact and Light Weight Diesel Engine

The new "110" diesel engine now being produced by Detroit Diesel Engine Division of General Motors, is a 6-cylinder, 2-cycle unit rated at 275 hp. This engine can be purchased (a) bare, (b) with full equipment for industrial or marine use, and (c) with special accessories for a variety of uses. Full information is available from the manufacturer at 13400 West Outer Drive, Detroit 28, Mich., or by using the coupon.

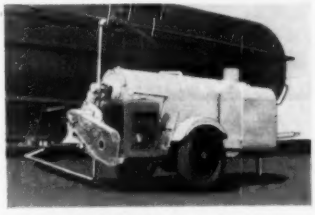


New "110" diesel

Use coupon on page 85; circle No. 8-11

Circulating Heater for Asphalt Tank Cars

Asphalt may be heated with this tank car heater either by pumping it from the bottom of the car, heating it and pumping back to the top of the car; or, where the asphalt is too stiff to pump, a heat transfer oil may be pumped through the steam coils of the car or tank. The heat transfer oil can be heated to 400° to 450°. With this indirect method of heating, a car can be heated 20° to 25° per hour, which is a little slower than when using the direct recirculation methods. Full data from W. E. Grace Mfg. Co., Dallas 15, Texas, or by using the coupon.



Grace tank car heater

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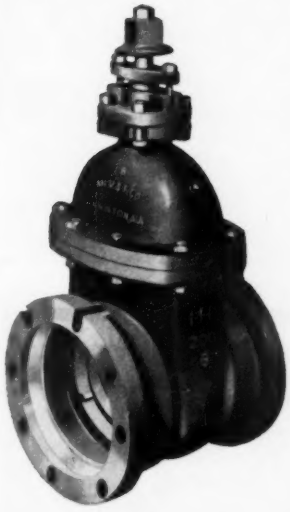

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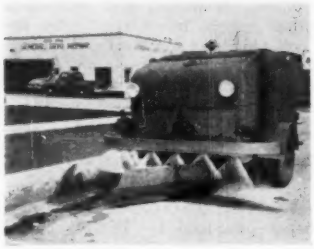
Portable Water Level Indicator for Wells

A small, compact and easily portable instrument has been devised for determining accurately the water level in wells or drill holes. The cable, batteries and operating components are all included in one small, easily carried unit. The indicator comes with 250 ft. of cable, but any additional amount can be provided if deeper wells must be tested. Write Fisher Research Laboratory, Inc., 1961 University Ave., Palo Alto, Calif., or use the coupon.

Use coupon on page 85; circle No. 8-13

Sweeper with Large Capacity Hopper

The road speed and large hopper capacity of this machine permits taking each load to a central dumping area instead of dumping it on the street. It has a dirt hopper capacity of 84 cu. ft., so that in smaller cities the load can go directly to the dump, eliminating the need for a pick-up crew and truck. Power is by a 110-hp Ford industrial engine. Conveyor system carries dirt from the broom to the hopper, and will operate independently of the broom. Dirt is



New Wayne Sweeper

dumped by gravity. Full data from Wayne Mfg. Co., Pomona, Calif., or by using the coupon.

Use coupon on page 85; circle No. 8-14

For Reseating Valves

A new valve reseater has been developed for ¼-inch to 1½-inch globe valves, but other reseaters are available for globe valves up to 12-inch, and gate valves to 16-inch and larger. Pump valves can be reseated with a special outfit. Valves that have ragged and uneven seats need reseating to prevent leakage and costly maintenance. Write Leavitt Machine Co., Orange, Mass., or use the coupon.

Use coupon on page 85; circle No. 8-15

Metal Post Straightener

Powered by a small high-capacity direct action hydraulic jack, this post straightener provides a quick and handy method of straightening parking meter posts, metal fence posts and sign posts. The jack is hand operated, and provision is made for pumping at the most convenient angle. Write H. K. Porter Co., Inc., Somerville, Mass., or use the coupon.

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Asphalt Plant with 50 to 75 Tons per Hour Capacity

Operating on the continuous process principle, this central-mix asphalt plant will produce 50 to 70 tons an hour, but is highly portable. No erection work is involved in setting it up. One unit is complete with burner, combustion chamber, drier, dust collector and fan,

Pioneer No. 51 Asphalt Plant

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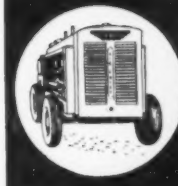

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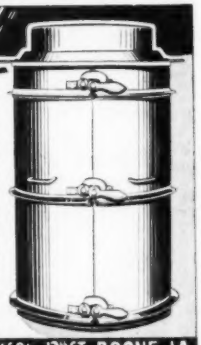

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For making pipe by hand methods by either the wet or semi-dry processes. Built to give more years of service—sizes for pipe from 10" up to 120" and larger—tongue and groove or bell end pipe at lowest cost.

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QUINN WIRE & IRON WORKS 1621 12TH ST. BOONE, IA

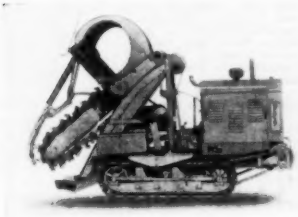
mounted on rubber tires. On the other unit are the screen, bins, elevator, pug mill and truck loading hopper, also on rubber. The entire plant is electric motor driven. For full data write Pioneer Engineering Works, 1515 Central Ave., Minneapolis 13, Minn., or use the coupon.

Use coupon on page 85; circle No. 8-17

Service and Utility Trencher

The Buckeye Model 402 trencher, just announced, will cut an 8-inch wide trench to a maximum depth of 4 ft. It is designed for house services, cables, gas and water line work. Top digging speed is 1,308 ft. per hour. It is crawler mounted and can work on hillsides, or with one crawler in the gutter and the other on the shoulder, as one crawler is adjustable vertically to a height of 8 ins. Full information from Gar Wood Industries, Inc., Findlay Division, Dept. 022-10, Findlay, Ohio, or by using the coupon.

Use coupon on page 85; circle No. 8-18



Service line trencher

Small Portable Compressors

These two new models are single-stage, mounted on two pneumatic tires, and capable of being handled in rough terrain and at high speeds. The "70" weighs 1,465 lbs., the "105" weighs 1,945 lbs. There are no couplings and no clutch. Full data from Gordon Smith & Co., Bowling Green, Ky., or by using the coupon.

Use coupon on page 85; circle No. 8-19

New Research and Development Laboratory of Portland Cement Association

The new research and development laboratory of the Portland Cement Association consists of two architectural concrete buildings joined by a covered walkway and providing about 98,000 sq. ft. of usable space. The new laboratory is

PCA Research Laboratory

located outside of Chicago, in the suburb of Skokie. The design of these structures are covered in a release issued by the Association (33 West Grand Ave., Chicago), which should be highly interesting to the structural engineer. It covers overall design, architectural and engineering features, columns and piers, and floor finishes. The illustration shows the very pleasing appearance of the buildings.

DARLEY PORTABLE PUMPS

Powered by Briggs and Stratton gasoline engines. Automatic Primer. Centrifugals, will handle without injury, water with sand, dirt and gravel content.

Model No. 1½AE— Weight 57 lbs. Capacity up to 40 gallons per minute. Pressures up to 75 lbs.

Model No. 4AE — Weight 115 lbs. Capacity up to 200 gallons per minute. Pressures up to 75 lbs.

Model No. 7AE — Weight 150 lbs. Capacity up to 300 gallons per minute. Pressures up to 80 lbs.

W. S. Darley & Co., Chicago 12

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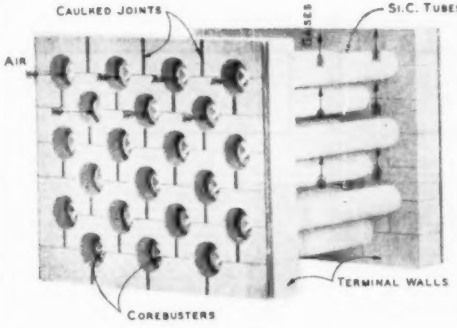
first step to a better incinerator...

FITCH AIR HEATERS



Fitch Recuperators (air heaters), by providing for the individual replacement of tubes when necessary, have an indefinitely longer life than the average heater. *Bulletin No. 11 explains why.* Address:

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DON'T LOSE Sewer Capacity

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OK Champion cleaners are regularly clearing sewers all over the world. New improvements make them better than ever. Send for literature.

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Hammond, Indiana

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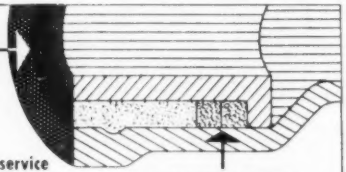

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NEW LISTINGS

Water Conditioning for Swimming Pools

56. Helpful design data for planning swimming pools is found in a 24-page bulletin on swimming pool equipment. Sand and diatomite filter units, backwash controls, hair catchers, chemical feeders, vacuum cleaners, etc. are all covered by flow diagrams and specs. Use coupon for copy. General Filter Co., Ames, Iowa.

New Life for Old Water Wells

127. A simple method for effective removal of clay, fine silt, iron and calcium deposits without use of corrosive materials has been announced by Calgon, Inc. Detailed information on the process can be obtained by using the coupon. Calgon, Inc., Hagan Bldg., Pittsburgh, Pa.

Pollution-Proof Outdoor Drinking Fountain

144. A new outdoor drinking fountain so designed that contamination by cross connections or back siphonage is not possible is fully described in a 4-page bulletin. Features neat appearance, easy installation. Write Murdock Mfg. & Supply Co., 426 Plum St., Cincinnati 2, Ohio, or use coupon.

Speed Controls for Link-Belt Drives

156. Automatic controls for P.I.V. Variable Speed Drives include mechanical, pneumatic, hydraulic and electronic controlling agents. Operation of drive in wide time cycle and speed ratio. Booklet 2349 gives full details. Link-Belt Co., 307 N. Michigan Ave., Chicago 1, Ill.

Corrosion-Resistant Materials For Chemical Handling

173. Chemical construction materials including corrosion-proof cements, linings and coatings, acid-proof brick and tile are announced by Atlas Mineral Products Co., 42 Walnut St., Mertztown, Pa. Description of complete line and handy estimating data in Bulletin MCC-1. Check coupon for your copy.

Complete Bulletin on Pipe Fittings

181. In Bulletin No. 104 the Kennedy Valve Mfg. Co. covers their complete line of Kennedy cast iron, malleable and bronze fittings, which includes recent additions of cast iron screwed, flanged, sprinkler and heavy-duty malleable fittings. Check coupon or write Kennedy Valve Mfg. Co., Elmira, N. Y.

Clear Explanation of Ion Exchange Systems

185. A new 12-page booklet explains in readable form the behavior, performance, uses and operation of "Monobed" ion exchange systems for water conditioning and other applications. Operating and equipment costs, water quality obtained, design and operation are covered in text and tables. Check handy coupon. Resinous Products Division, Rohm & Haas Co., Washington Sq., Philadelphia 5, Pa.

Here's Latest Data On Federal Trucks

200. The Federal "Style Liner" features new design that means big truck value, with power and stamina for heavy-duty operation. Use coupon today for colorful folders that show how the new Federal matches your trucking needs. Federal Motor Truck Co., Detroit 9, Mich.

Data Sheets on Pipe Cutters and Testing Plugs

216. The Ellis pipe cutter for making clean cuts in close quarters, and pipe clamps and plugs for main testing or temporary closings are both described in Catalog 33. Includes parts list. Ellis & Ford Mfg. Co., Ferndale 20, Mich.

How the Sludge Contact Reactor Operates

217. Full description of the Cochrane-Liquon sludge contact reactor shows how previously formed precipitates accelerate clarification and softening of water. Flow diagrams show typical installations. Use coupon for copy of publication 5001. Cochrane Corp., Philadelphia 32, Pa.

How Black Top Salvage Speeds Road Repair

218. Breaking and pulverizing old black top roads for re-laying, and more efficient earth compaction are the two-purpose operations of the new Hyster grid roller. A full description of the roller itself—how it works and what it does—plus details of the bituminous salvage and earth compaction operations are presented in Form 1143. Get your copy by checking coupon. Hyster Co., Portland, Ore.

Investigate "Package" Bridges To Speed Construction and Save Money

219. Three basic elements of precast reinforced concrete—cribbing, bridge seat and bridge deck slabs—are combined for construction of bridges up to 40' span. Details of the units, and a construction story in step-by-step pictures are contained in the new PB-50 Bulletin issued by Universal Concrete Pipe Co., Columbus 15, Ohio. The handy coupon will get your copy quickly.

Bitumels Paving Handbook Full of Useful Data

183. A new 80-page edition of the Bitumels Paving Handbook covers a wealth of practical data on paving methods and materials, road and airport paving specifications and construction details, complete tabular data on asphaltic binder applications and aggregate requirements, condensed Asphalt Institute specifications plus data on Laykold compounded asphalts for flooring, tennis courts, protective coatings and waterproofing. You can have a copy by checking the coupon. American Bitumels Co., 200 Bush St., San Francisco 4, Calif.

The Easier Way For Pavement Breaking

220. Rapid Pavement breaking the low cost way is described in bulletins issued by the R.P.B. Corp., 2751 East 11th St., Los Angeles, Calif. Both "Mighty Midget" and heavy-duty truck-mounted models make quick, clean cuts, break trench openings or tamp backfill. Use coupon for full data.

Where You Can Use Air-Entrained Concrete

221. Atlas Duraplastic air-entraining portland cement has been chosen for all types of concrete structures because it is more workable, more durable, more uniform. Bulletins of the Universal Atlas Cement Co., 135 East 42nd St., New York 17, N. Y. describe its many applications and advantages.

Here's Data on Fluoride To Combat Tooth Decay

223. Technical data for municipalities interested in the use of sodium fluoride for addition to water supplies is available from the General Chemical Div., Allied Chemical & Dye Corp., 40 Rector St., New York 6, N. Y. Information includes data from communities now using fluoride to reduce tooth decay.

Does Your Water Works Have Standby Power?

224. Dependable Climax power plants are ready for emergency service to insure fire protection, and can also save power costs by peak load operation. Use the coupon for full data on Climax, 40 to 495 HP, operating on sewage or natural gas, butane or gasoline. Climax Engine & Pump Mfg. Co., Clinton, Iowa.

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Vacuum Filter Design Data

225. Typical flow diagrams, details of operation, power requirements and standard sizes of individual units and "package" units of the Oliver Sewage Sludge Dewaterer are presented in Bulletin 219. Check coupon for your copy. Oliver United Filters, Inc., 33 W. 42nd St., New York, N. Y.

CONSTRUCTION EQUIPMENT

How to Keep Your Loader On the Job

50. Don't take more time to move your loader to the job than to do the work. Investigate the Eagle Truck Mounted Loader for handling gravel, sand, cinders, snow from windrows or piles. Get forms 444 and 947 from Eagle Crusher Co., Inc., Galion, Ohio.

Handy Catalog Covers Complete Tractor and Grader Line

70. A new 20-page booklet in a handy pocket size features Allis-Chalmers complete industrial tractor line. The importance of wise buying and fitting the equipment to the job is emphasized. Don't miss your copy. Use coupon today. Allis-Chalmers Mfg. Co., Tractor Div., Box 512, Milwaukee, Wis.

52-Page Data-Packed Bulletin On Contractors' Pumps

95. Tables for pump size determination on every excavation job, pipe friction loss, attitude effects and lots of other valuable data are included in this comprehensive booklet illustrating the many Jaeger "sure-prime" pump applications. Get your copy (catalog P45) by checking our coupon or writing the Jaeger Machine Co., Dept. PW, Columbus 16, Ohio.

Grading Can Be Faster, Cheaper and Easier

96. You'll like every feature of the Austin-Western 99H Grader. It has all-wheel drive, all-wheel steer, controlled traction, precision sideshift and a high lift, extreme reach, reversible blade. Get data from Austin-Western Co., Aurora, Ill.

The Right Tractor For Your Job

116. Whether you need a front-end loader, snow plow, bulldozer, sweeper or mower, International wheel tractors combine correctly with allied equipment to do the job. Your choice of gasoline or diesel units is illustrated in Bulletin A-103JJ. International Harvester Co., 180 N. Michigan Ave., Chicago 1, Ill.

Check "Gunite" Concrete For Every Application

158. Big 44-page book illustrates "Gunite" uses for both repair and new construction of sewers, tanks, dams, swimming pools, and all concrete structures. A multitude of applications. Be sure to check coupon or write Pressure Concrete Co., Dept. PW, 315 S. Court St., Florence, Ala.

Hydraulic Dump Bodies Feature Trouble-Free Hoist

165. Get data on Heil Twin-Arm hoists and bodies for 1½ to 2½ ton trucks and learn how reliable hoist and sturdy body will keep your truck in service with less repair and maintenance. Bulletin BH 4662-G gives details. The Heil Co., Dept. PW, 3000 W. Montana St., Milwaukee 1, Wisc.

Versatile Wheeled Tractor Handles Countless Jobs

204. A new booklet on industrial wheeled tractors recently published by The Oliver Corp. covers the complete Oliver line. Many application photos show use of tractors with matched allied equipment such as bucket loaders, maintainers, plows, mowers, brooms, etc. Get this bulletin, Form A-918, from The Oliver Corp., 19300 Euclid Ave., Cleveland 17, Ohio.

Self-Priming Trash Pumps Work "High and Dry"

205. The maintenance difficulties of submerged trash pumps is avoided in the new nonclogging, self-priming trash type sump pumps described and illustrated in Form 9-ST-11, issued by The Gorman-Rupp Co., Mansfield, Ohio. Performance curves and specifications are included.

SEWERAGE AND WASTE TREATMENT

Water Level Controls for Sewage and Water Plants

31. Dependable float-operated pump and motorized valve controls for single or multiple pump installations are described in bulletins issued by the Water Level Controls Div., Healy-Ruff Co., 719 Hampden Ave., St. Paul 4, Minn. All units feature splash proof construction, mercury tube switches.

How You Can Dispose Of Sewage Solids

54. Nichols Herreshoff incinerator for complete disposal of sewage solids and industrial wastes—a new booklet illustrates and explains how this Nichols incinerator works. Pictures recent installations. Write Dept. PW, Nichols Engineering and Research Corp., 70 Pine St., New York 5, N. Y.

Standard Forms for Concrete Pipe

67. Concrete pipe for sewerage, drainage and culvert projects can be produced quickly and uniformly with Quinn Standard concrete forms. Data on forms for 12" to 84" tongue and groove or bell end reinforced pipe from Quinn Wire and Iron Works, 1621 12th St., Boone, Iowa.

Recording Meters for Parabolic Flumes

73. Engineering data on parabolic flumes and accurate companion meters for open flow water and sewage metering is given in Simplex bulletin 210. Installation data and calibration included. Write Simplex Valve and Meter Co. Dept. 4, 6750 Upland St., Philadelphia 42, Pa.

Engineering Facts About Transite Pipe

83. This compilation of Johns-Manville's "Engineering Facts" series presents concise, factual information about Transite's many economic and engineering advantages, and includes

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Melts tar, asphalt and bituminous compounds up to 70% faster; saves 50% on fuel; is safer to operate. Features exclusive flash-proof lined flues, new well type oil burner, fast flow draw-off cock. Built in pneumatic-tired or steel wheel types in 40- to 165-gallon sizes. Write for bulletin.

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2" thru 12"

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Birmingham 2, Alabama

informative case histories plus dimensions and data for your files. Write Johns-Manville, Box 290, New York 16, N. Y., or use the handy coupon.

How Cities Can Do Complete Sewer Cleaning From Street

98. Literature illustrating how cities, towns and villages using OK Champion Sewer Cleaners are doing a complete sewer cleaning job from street level. Power machines available in addition to full line of sewer rods and accessories. Issued by Champion Corporation, 4752 Sheffield Avenue, Hammond, Indiana

Useful Data on Butterfly Valves

100. Complete descriptions and tables of dimensions on the full line of Rockwell Butterfly Valves is contained in several bulletins published by the company. Construction details and special control features are illustrated. Write W. S. Rockwell Co., 200 Eliot Street, Fairfield, Conn

Complete Catalog for Engineers Shows Sewage Plant Equipment

110. A complete, 44-page catalog gives engineering data on Jeffrey equipment for water, sewage and industrial waste treatment plants including screening, screenings grinder-grit collectors and washers, settling tank collectors, feeders, Floctrols, mixers and other mechanical equipment. Use coupon to get Catalog 775-A, Jeffrey Mfg. Co., Columbus 16, Ohio.

Underdrains—Hidden But Important Filter Components

113. For filter bottoms this firm makes "Armcre" vitrified salt glazed floor blocks which provide ducts occupying 50% of the floor cross-section and air openings aggregating over 24% of the floor area. Described in several leaflets and data sheets. Ayer-McCarel-Reagan Clay Co., Brazil, Ind.

Need Low-Cost Air For Sewage Treatment?

122. New 20-page booklet shows operating and construction features of Rotary Positive Blowers engineered to fit your needs. Air for activated sludge, water treatment; constant vacuum for filtering. Bulletin 22-23-B-13 gives details. Roots-Connersville Blower Corp., 508 Poplar Ave., Connersville, Ind.

Standard Translot Blocks For Filter Underdrains

145. Proper filter underdrainage is extremely important. Specifications and installation details for transverse slot filter underdrains made of durable vitrified clay are available from Texas Vitrified Pipe Co., Mineral Wells, Texas.

Conkey Filters for Sewage Sludge Disposal

180. Development of Conkey sludge filters and applications to all types of sewage sludge are described in Bulletin 100. Tables show filter sizes, weights, and give average anticipated results. Write General American Transportation Corp., Process Equip. Div., 10 East 49th St., New York 17, N. Y.

Air for Activated Sludge and Other Aeration Processes

187. Quiet operation, high efficiency and compact size are features of the Chicago "Standardaire" positive displacement blower. Wide range of capacities available to fit your needs. Details and performance data from Chicago Pump Co., 2348 Wolfram Ave., Chicago 18, Ill.

Eight Advantages of Vacuum Sludge Dewatering

189. Efficient sewage treatment requires economical sludge disposal. Eight advantages of vacuum dewatering of sewage sludge are described in a new folder issued by the Eimco Corp., Salt Lake City 8, Utah. Use the coupon for your free copy.

POWER AND LIGHT

Air Cooled Engines for Hundreds of Applications

137. Tested under severest conditions of long, hard use, these engines have earned world wide recognition as the "right" power for hundreds of applications. Get latest bulletin from Dept. PW, Briggs and Stratton Corp., Milwaukee 1, Wisc.

Low Cost Power From Dual Fuel Engines

154. Operating on the Diesel cycle, burning either oil or gas, the Worthington Supercharged Dual Fuel Diesels give high economies by running on the cheapest fuel available. Get complete data from Worthington Pump & Machinery Corp., Dept. PW, Harrison, N. J.

Superior Features for Municipal Power Plants

168. Optional use of by-product gases, such as sewage sludge gas, stamina and precision construction, fuel economy and conservative rating are some of the noteworthy features of Superior Diesel Engines, described in Bulletin 4812. For a copy write The National Supply Co., Superior Engine Div., Toledo, Ohio.

Dependable Power For Every Purpose

170. Rugged Novo engines are built to handle heavy-duty loads; operate on gasoline, kerosene, gas-gasoline. Several models range from 4 HP to 32 HP. Get bulletins from Novo Engine Co., Lansing, Mich.

REFUSE COLLECTION AND DISPOSAL

New Unit Cleans Catch Basins in a Jiffy

34. Simple powerful pneumatic bucket is featured by Netco Catch Basin Cleaner. Foldet 33A gives details and illustrates operation of complete self powered truck mounted unit. Netco Div., Clark-Wilcox Co., 118 Western Ave., Boston 34, Mass.

How to Lower Costs Of Refuse Collection

35. For saving trucks, labor and time in city rubbish collection get details of the new Dumpster-Kolector described in literature just published by Dempster Bros., Inc., 980 Dempster Bldg., Knoxville 17, Tenn.

How to Build and Operate A Sanitary Fill

146. A complete discussion of many types of sanitary fill construction, together with cost data from communities of all sizes, is offered by the Drott Mfg. Corp. Get this valuable presentation on the Drott Bullclam and International Crawler tractor combination, specially designed for all phases of sanitary fill work, by checking the handy coupon, or write Drott Mfg. Corp., Milwaukee 8, Wis.

Investigate This Plan For Garbage Elimination

164. A new presentation, written especially for municipal officials, offers a modern solution for the garbage disposal problem. Be sure you have this up-to-date information on the elimination of city garbage collection by the use of Hotpoint Disposall units. Check the coupon now. Hotpoint Disposall Department, 5600 West Taylor St., Chicago 44, Ill.

An Incinerator Necessity

215. Recuperators featuring individual replacement of the heat transfer elements (silicon carbide tubes) for maximum accessibility and efficiency are described and illustrated in Bulletin 11 issued by Fitch Recuperator Co., Dept. PW, Plainfield Nat'l Bank Bldg., Plainfield, N. J.

WATER WORKS

How to Keep Trenching Jobs on Schedule

24. The easy maneuverability of the tough, compact Cleveland Model 95 "Baby Digger" makes it well suited for the difficult job of trenching past the many obstacles of city and suburban work. Multiple digging and crawler speeds handle all soil types and trench widths up to 24". Get Bulletin S-52 from Cleveland Trencher Co., 20100 St. Clair Ave., Cleveland 17, Ohio.

Makes Underground Pipe Installations Easy

25. One-man operated Hydraulic Pipe Pusher pushes pipe through ground under streets, sidewalks, lawns and other obstacles.

Something to think about *twice!*

In painting bridges . . .

it costs, on the average, $3.23 in labor and overhead for every $1.00 spent for paint.

Therefore PAINT LIFE is of vital import.

Example: total painting cost — $5,000. If job lasts 6 years — cost per year $833. If it lasts 9 years — cost per year only $556. A SAVING OF OVER 33%!

Typical Dixon Paint Job — 3½-mile New Jersey bridge. Painted 1932. Repainted 1946 to 1949. After 16 years service — Dixon Flake Silica-Graphite Paint was still giving 85% protection.

Write or phone for more facts.

• • •

The part Flake Graphite plays in painting economy . . . Overlapping like the protective scales of a fish, the flat flakes of Dixon Silica-Graphite produce a lamination within the paint film, forming a coating that is impervious to moisture and fumes.

Specialists in outdoor paints for metal, Dixon puts into these high quality paints . . .

Almost a Century of Experience

JOSEPH DIXON CRUCIBLE COMPANY, DEPT. 8-P JERSEY CITY 3, NEW JERSEY

DIXON

FLAKE

SILICA GRAPHITE PAINTS

"GUNITE"

FOR REPAIR OF

DAMS

Regardless of state of disintegration, dams can be repaired economically with a resurfacing of reinforced "Gunite."

● *YEARS OF ADDED SERVICE*
● *LOW MAINTENANCE*

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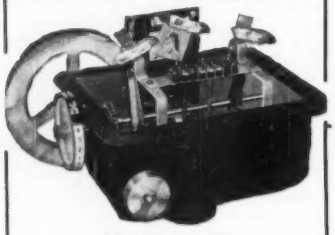
Our operations are nationwide

PRESSURE CONCRETE CO.

"Gunite" Contractors and Engineers

193 Emmet St., Newark 5, N. J.
So. Court St., Florence, Ala.
33 No. La Salle St., Chicago, Ill.
Liberty Life Bldg., Charlotte, N. Car.

ROTO-TROL



RF-2
with ALTO-TROL

Puts that second pump to work.

A 2-pump RF-2 ROTO-TROL with a built-in ALTO-TROL will operate each pump on alternate starting cycles, assuring equal use and wear of both pumps. Operates both pumps when required.

Depth Indicator optional—extra.

Write for full data.

Water Level Controls Division

HEALY-RUFF Company

791 Hampden Ave., St. Paul 4, Minn.

Pays for itself in man hours saved on first few jobs. For complete facts and prices, ask for booklet S-117, Greenlee Tool Co., Dept. PW, 2048 Twelfth St., Rockford, Ill.

Is Your City Metered 100%?

33. 100% metering as practiced by many cities requires accurate, dependable meters with interchangeable parts. Cut-away views of every part, capacity and size data are all included in handsome American-Niagara water meter booklet available from Buffalo Meter Co., 2920 Main St., Buffalo 14, N. Y.

Do Your Water Mains Need Cleaning?

38. Literature on Flexible method of cleaning water mains any size from 2" to 72", giving full details and list of nearest representatives in all parts of country. Address: Flexible Underground Pipe Cleaning Co., 9059 Venice Blvd., Los Angeles, Calif.

Data on Modern, High-Rate Water Treatment Plant

40. This handsome 28-page bulletin gives a comprehensive yet understandably written story of the development of the Accelator, and explains its principles, advantages, design considerations, operation and applications. Helpful flow diagrams and specifications. For a copy use the coupon or write Infilco Inc., 325 W. 25th Place, Chicago 16, Ill. Ask for Bulletin 1825.

Chem-O-Feeders for Automatic Chemical Feeding

60. For chlorinating water supplies, sewage plants, swimming pools and feeding practically any chemical used in sanitation, treatment of water and sewage. Flow of water controls dosage of chemical; reagent feed is immediately adjustable. Starts and stops automatically. Literature from % Proportioneers, Inc. %, P. O. Box 1342, Providence 1, R. I.

Helpful Data on Hydrants

64. Specifications for standard AWWA fire hydrants with helpful instructions for ordering, installing, repairing, lengthening and using. Issued by M. & H. Valve & Fittings Co., Dept. P.W., Anniston, Ala.

Cast Iron Pipe and Fittings For Every Need

65. Cast iron pipe and fittings for water, gas, sewer and industrial service. Super-deLavaud centrifugally-cast and pit-cast pipe. Bell-and-spigot, U. S. Joint, flanged or flexible joints can be furnished to suit requirements. Write U. S. Pipe and Foundry Co., Dept. PW, Burlington, N. J.

Radiophone Equipment for Two-Way Communications

68. Increased efficiency is available to all departments through the use of two-way Radiophone equipment. Full description of compact 30-watt mobile model, 30- and 60-watt base station equipment will be sent promptly. Write Raytheon Mfg. Co., Dept. 6460PW, Waltham 54, Mass.

96 Page Book Helps Solve Water Problems

71. pH and Chlorine Control. A discussion of pH control and description of comparators, chlorimeters and similar devices. A 96 page booklet. W. A. Taylor & Co., 7304 York Road, Baltimore 4, Md.

All Electric Floatless Liquid Level Control

78. Description of operating principles and applications of B/W controls shows the simplicity and many uses of these all-electric, floatless devices. Diagrams of typical installations and engineering data all in bulletin 147 issued by B/W Controller Corp., Dept. PW, Birmingham, Mich.

Speedier, Space-Saving Purification Apparatus

81. A new 12-page bulletin, No. 2204, tells how the Spaulding Precipitator, in removing impurities from a liquid by precipitation, adsorption, settling, and upward filtration, occupies less space, uses less chemicals and speeds up treatment. Permutit Co., 330 West 42nd St., New York 18, N. Y.

Flow Meters With Many New Features

91. The new Propelflo meter for main-line metering introduces many new features you will want to look into. Send for latest bulletin today. Builders-Providence, Inc., Box 1342, Providence 1, R. I.

Painting Water Tanks For Longer Protection

94. High labor costs demand special consideration when painting elevated water tanks. This and other factors involved in proper paint selection are discussed in a bulletin issued by Jos. Dixon Crucible Co., Jersey City 3, N. J. Helpful specifications for repainting water tanks are also included.

Tested Jointing Materials

102. "Hydrotite" is a self-caulking, self-sealing joint compound for bell and spigot pipes. For data book and sample write Hydraulic Development Corp., 50 Church St., New York, N. Y.

Well Water Systems Built to Last

105. Layne pumps are built for wells ranging from 4" to 36" diameter and in capacities from 50 to 16,000 gpm. Full engineering data and many installation views are given in 32 page Pump Bulletin 4-42. Layne and Bowler, Inc., Memphis, Tenn.

Pressure Pipe That Retains Capacity

106. Several bulletins describing the construction of pressure pipe, list of installations, carrying capacity tests, making service connections under pressure; and detail descriptions of several installations. Lock Joint Pipe Co., Box 269, East Orange, N. J.

Rapid Sand and Pressure Filter Data

109. Rapid sand filters. A complete line of vertical and horizontal pressure filters, wooden gravity filters, and filter tables and other equipment. For engineering data, write Roberts Filter Manufacturing Co., 640 Columbia Ave., Darby, Pa.

Specs for Gate Valves

112. Rigidly inspected gate valves for pressures up to 175 lbs. by R. D. Wood Co. Sizes 2" to 30"; for any standard type joint. R. D. Wood Co., Public Ledger Bldg., Philadelphia 5, Pa.

Do You Ever Have Leaks to Fix?

124. You'll want to know about the full line of "Skinner-Seal" clamps for repairing bell and socket joint leaks and broken mains. Step-by-step procedures are illustrated in catalog 41, a handsome 40-page presentation which shows applications of all fittings. Write M. B. Skinner Co., Dept. PW, South Bend 21, Ind.

Design Details on Flash Mixers and Flocculators

128. Descriptions of Dorr equipment for the basic steps of flash mixing and flocculation, sizes and design data for transverse flow flocculator, installation plans and sections are all included in Bulletin 6971. Write The Dorr Company, Barry Pl., Stamford, Conn., or use handy coupon.

Find Buried Pipe The Goldak Way

131. Finding buried pipe is easy with the new Featherweight Goldak Pipe Locator. An easy-to-read illustrated bulletin tells the full story quickly. Address: The Goldak Co., 1544 Glenoaks Blvd., Glendale 1, Calif.

All About Cement-Mortar Lining of Water Mains

133. Here, in a really beautiful booklet, is practically everything you need to know about this method of lining mains in place—the needs, methods, and results that will interest you. Centriline Corp., Dept. PW, 140 Cedar St., New York 6, N. Y.

How Elevated Water Tanks Can Save on Operating Costs

134. Beautiful new booklet on Horton elevated steel water tanks suggests ways to reduce pumping costs, increase capacity of sys-

When you need special information—consult READERS' SERVICE DEPT. *on pages 85-89.*

tems, maintain uniform pressure, etc. Illustrates 7 models of welded, ellipsoidal-bottom, elevated steel tanks in full color. Write Chicago Bridge & Iron Co., 2115 McCormick Bldg., Chicago 4, Ill.

Faster Pipe Laying With Precaulked and Threaded Joints

148. McWane 2" cast iron water pipe with threaded joints and precaulked bell and spigot pipe are described in folder WM-47. Additional data on 3" to 12" centrifugally cast pipe and fittings in folder WL-47, both issued by McWane Cast Iron Pipe Co., Birmingham 2, Ala.

Helpful Data on Corporation Stops

161. A complete line of brass goods for water works: corporation stops, curb stops, service pipe couplings, gooseknecks and other fittings are illustrated and described in catalog W-39, issued by A. Y. McDonald Mfg. Co., Dubuque, Iowa. Get your copy for ready reference.

Fabrication with Everdur For Long-Range Economy

169. Corrosion-resistant Everdur alloys are available in all wrought commercial shapes suited for dozens of applications in water and sewage plants. Many examples shown in Publication E-11 issued by The American Brass Co., Waterbury 20, Conn.

Two-Way FM Radio Telephone Equipment for All Departments

197. The benefits of two-way radio communciation for all departments of municipalities and counties make full information on this subject important to all engineers. For descriptions of Motorola FM systems, or for specific recommendations concerning your application write to Dept. PW, Motorola, Inc., 4545 Augusta Blvd., Chicago 51, Ill.

Chlorination for Large and Small Pools

210. Dependable chlorination is a necessity for all swimming pools, no matter how large or small. You can find out just how to protect your pool in the most dependable and economical way by using the coupon or writing Wallace & Tiernan Co., Inc., Box 178, Newark 1, N. J.

STREETS AND HIGHWAYS

How to Select the Proper Sno-Plow for Your Truck

21. Fully illustrated 24-page catalog on Frink Sno-Plows includes valuable tables on proper plow and leveling wing selection for mounting on all size trucks. Detailed discussions cover special features which result in performance plus economy. Use coupon for copy. Frink Sno-Plows, Inc., Clayton, 1000 Islands, N. Y.

Levels Sidewalks and Curbs Quickly and Easily

29. How the Mud-Jack Method for raising concrete curb, gutter, walls and streets solves problems of that kind quickly and economically without the usual cost of time-consuming reconstruction activities—a new bulletin by Koehring Company, 3026 W. Concordia Ave., Milwaukee 10, Wis.

Building State, County and Township Roads

47. The story of better roads for fewer taxpayers' dollars is told in an excellent bulletin describing "Caterpillar" diesel motor graders. These versatile units serve state, county and township bodies all year long on construction, maintenance and snow removal. Get bulletin D831 from Caterpillar Tractor Co., Peoria, Ill.

Latest Maintenance Equipment for Blacktop Roads

52. "Blacktop Road Maintenance and Construction Equipment"—Asphalt and tar kettles, flue type kettles, spray attachments, tool heaters, surface heaters, road brooms and rollers. This is modern and up-to-date equipment for blacktop airport and road construction and maintenance. Write for Catalog R. Littleford Bros., Inc., 452 East Pearl St., Cincinnati 2, Ohio.

Power Saw Speeds Pruning, Clearing

69. Don't wait until storms have broken limbs and felled trees before finding out about the new light-weight engine powered chain saw announced by McCulloch. Ideal for all contracting and tree-maintenance operations. Get bulletin from McCulloch Motors Corp., Dept. MP, 6101 W. Century Blvd., Los Angeles 45, Calif.

Heating, Thawing and Melting With Hauck Burner Equipment

142. A newly released 16-page bulletin covers the complete line of Hauck heating and melting equipment. Data covers units for every water, sewer and street department purpose, from "one-man" burners to large size portable kettles. A useful addition to your reference file. Get Bulletin 1068 from Hauck Mfg. Co., 117-127 Tenth St., Brooklyn 15, N. Y.

How to Save Time on Curb and Gutter Work

143. Every type of curb and gutter work is illustrated in the 12-page Heltzel catalog on steel forms for building concrete curbs, gutters and sidewalks. Time-saving setups show how to speed up the job and save money. Get your copy from Heltzel Steel Form & Iron Co., Dept., PW, Warren, Ohio.

Road Widening With Concrete, Bituminous Mix or Gravel

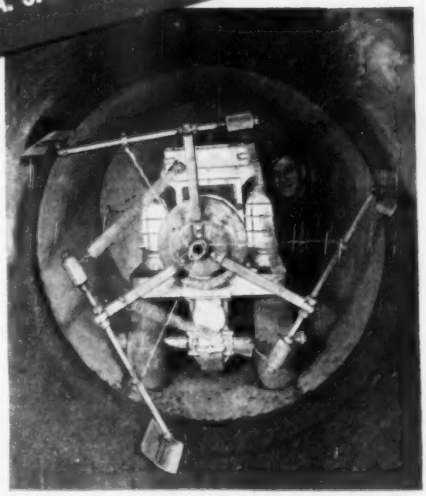
149. All types of road building materials are handled quickly and accurately by Apsco Wideners. New illustrated bulletin shows operations on all types of widening strips, gives details on wideners and trench rollers. Issued by All Purpose Spreader Co., Elyria, Ohio.

How Armco Strength Helps Culvert Design

196. Loading problems of drainage structures may involve high dead loads, live load impact or strong disjointing forces. A colorful new folder shows how flexible Armco corrugated metal structures meet these difficult job requirements. Get illustrated folder CMS-2650 from Armco Drainage & Metal Products, Inc., Dept. PW, Middletown, Ohio.

CENTRILINE
CONFORMS STRICTLY WITH A.W.W.A. SPECIFICATIONS

▶▶▶ PIPE LINING FACTS NO. 3



▶▶▶▶ The Standard Specifications for cement-mortar protective coatings issued by the American Water Works Association provide: "Interior of the entire line, including both curves and tangents, shall be by centrifugal machine . . . the machine shall apply the mortar by centrifugal action without the use of compressed air and follow its application by automatic trowelling to a uniform thickness and smooth finished surface."

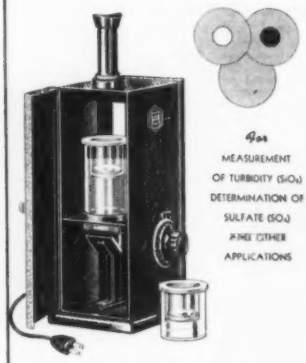
The strict adherence to these specifications by Centriline insures a continuous, dense, smooth lining—applied without rebound—that means restored carrying capacity perpetually sustained and longer life to mains. If pipelines are losing efficiency it is time to consider Centrilining. Our engineers stand ready to assist you, without obligation.

▶▶▶▶ WRITE TODAY FOR THE 28 PAGE CENTRILINE CATALOG

CENTRILINE CORPORATION
A subsidiary of Raymond Concrete Pile Co.
140 CEDAR STREET • NEW YORK 6, N.Y.
Branch Offices in all Principal Cities in the United States and Latin America.

CEMENT MORTAR LININGS FOR WATER MAINS
Centrifugally Applied in Strict Conformity with A.W.W.A. Specifications

HELLIGE
TURBIDIMETER
A TURBIDIMETER WITHOUT STANDARDS
Accurate • Foolproof • Universal



For MEASUREMENT OF TURBIDITY (SiO_2) DETERMINATION OF SULFATE (SO_4) AND OTHER APPLICATIONS

WRITE FOR CATALOG No. 8000
HELLIGE
INCORPORATED
3718 NORTHERN BLVD. LONG ISLAND CITY 1, N.Y.

PURE WATER

MAKES FRIENDS and LOWERS COSTS

General Filter Co.
SOLVES WATER PROBLEMS

GFC and Layne engineers work closely with municipal and industrial officials for the fast, economical elimination of water treatment problems.

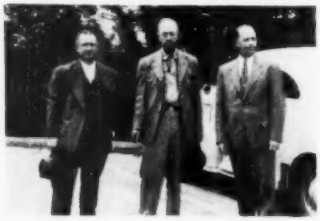
This complete service includes each step from the original survey of the problem to the installation of water purification equipment in the plant.

GFC is part of the nation-wide Layne organization with engineering and construction facilities in every area. Write for detailed information.

A Layne Affiliate
GENERAL FILTER CO.
923 2nd St. • Ames, Iowa

WORTH TELLING . . . By Arthur K. Akers

Dallas Nelson, advertising director of **Layne & Bowler,** Memphis, snapped these three at the end of 18 holes of single combats on the rugged Merion Country Club course in the Water and Sewage Works Manufacturers' golf tourney during the recent A.W.W.A. meeting in



Philadelphia. Left to right: **Joe Gilbert** of Link-Belt Company, **W. A. Hardenbergh** of PUBLIC WORKS, and **George Kelsey** of Builders Iron Foundry.

•

Col. Hardenbergh is also appearing prominently in the New York papers these days following his appointment by **Mayor O'Dwyer** as special consulting engineer to the City Health Department. His first assignment, under his appointment, is to coordinate the city rodent control activities, now being carried on by a number of the city's departments.

•

Photographed at **Dempster Brothers'** plant in Knoxville inspecting a Dempster Diggster (below) are 41

engineers from 15 foreign countries on tour of the U. S. under ECA sponsorship.

•

Federal Motor Truck Company unveiled their new Style Liner series models at the Waldorf, in New York, on June 28 with a press preview and luncheon that yet lingers in our memory and rings in our ears. If the requested photo of the unveiling by two beautiful gals provided by the **Jay H. Maish** advertising agency on Gospel Hill in Marion, Ohio, arrives in time you will see it below.

•

25 manufacturer exhibitors were signed up at last report for the October 9-12 Federation of Sewage Works convention in Washington, D. C. Room for more who hurry. **Miss Dorothy Dimmers,** acting secretary-manager, informs us.

•

Erling B. Stockmann, formerly with Consolidated Edison Company, New York, is now president of the **Arnessen Electric Company,** also of New York.

•

The **Dresser Manufacturing Division,** Bradford, Pa., steps up service on its pipe couplings, etc. by opening a new west coast warehouse in South San Francisco with **Paul McCullough,** a Dresser old-timer, as manager.

•

BIF Industries of Canada, Ltd., will soon be located in Toronto to produce Venturi meters, flow controllers and gauges. Chlorinizers, chlorine gas feeders, and **Omega** gravimetric and volumetric chemical feeders. Keith Mercer, Reg'd., continue as Canadian sales agents.

•

Caterpillar Tractor Company announces **John E. Jass** as assistant chief engineer, and the promotion of seven more engineers as Caterpillar continues to pace progress.

•

J. Lawrence Kennedy has been elected vice president, secretary, and a director of **The Kennedy Valve Manufacturing Company,** Elmira, N. Y.

•

Too late for July publication came the sad news of the sudden passing of **"Herb." Hollberg,** of **"Proportioneers Inc."** Herb., a friendly and familiar figure at water works meetings, had been with "Props." since 1933—in Chicago, as European representative in his native Sweden, and since 1945 as vice president, in Providence.

Mr. Hollberg

When you need special information—consult READERS' SERVICE DEPT. on pages 85-89.

16" and UP

If your requirements call for transmission or distribution mains of 16" diameter or larger, Lock Joint Pipe Company can provide high quality concrete pressure pipe in all standard diameters and some intermediate sizes. Starting at a minimum of 16", Lock Joint Concrete Pressure Pipe is produced in 32 different diameters, and its four distinct types of structural design cover every working condition common to American water works practice.

Not only does Lock Joint Concrete Pressure Pipe qualify fully under A.W.W.A. specifications, but it alone embodies, in a conventionally designed pipe priced to meet competition, all the nine time-tested characteristics listed at right:

- **PERMANENT HIGH CARRYING CAPACITY**
- **PROOF AGAINST TUBERCULATION, CORROSION AND ELECTROLYTIC DAMAGE**
- **IMMUNITY TO RUPTURE OR BLOW-OUT**
- **SAFETY UNDER EXTREME EXTERNAL LOADS**
- **EVERY JOINT FLEXIBLE AND WATERTIGHT**
- **EASILY TAPPED**
- **SPECIALS TO MEET INDIVIDUAL SPECIFICATIONS**
- **USEFUL LIFE CONSERVATIVELY ESTIMATED AT 100 YEARS**
- **MINIMUM MAINTENANCE AND REPAIR COSTS**

Whether your proposed line is large or small it will pay you to use Lock Joint Concrete Pressure Pipe, the pipe of proven durability, economy and dependability.

SCOPE OF SERVICES Lock Joint Pipe Company specializes in the manufacture and installation of Reinforced Concrete Pressure Pipe for Water Supply and Distribution Mains in a wide range of diameters as well as Concrete Pipes of all types for Sanitary Sewers, Storm Drains, Culverts and Subaqueous Lines.

LOCK JOINT PIPE COMPANY

Est. 1905

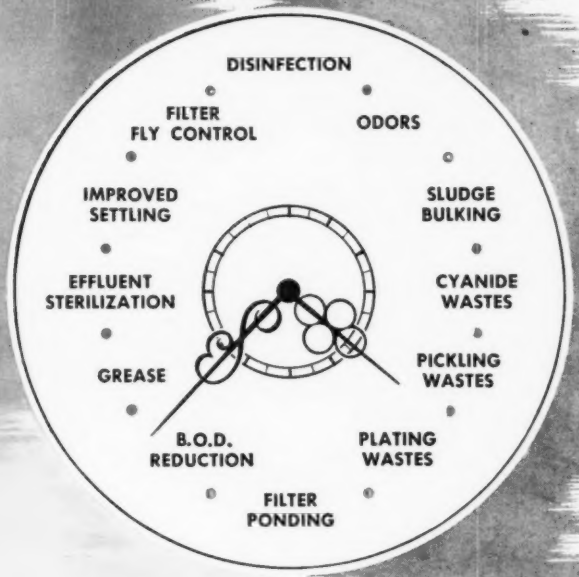
P.O. Box 269, East Orange, N. J.

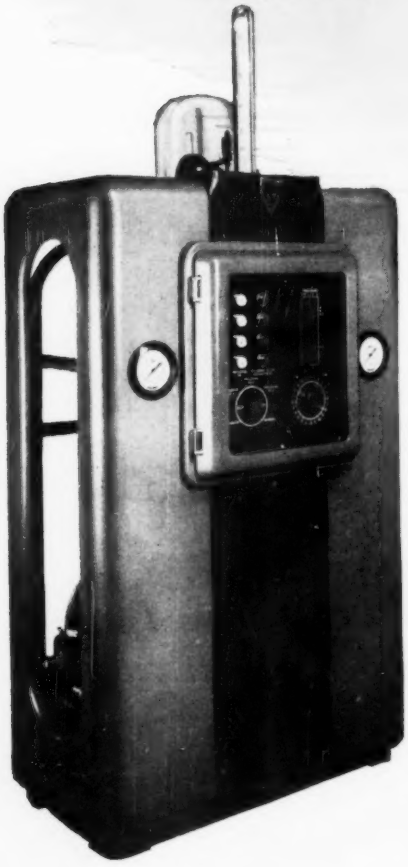
PRESSURE PIPE PLANTS: Wharton, N. J., Turner, Kan., Detroit, Mich.

BRANCH OFFICES: Casper, Wyo. • Cheyenne, Wyo. • Denver, Col. Kansas City, Mo. • Valley Park, Mo. • Chicago, Ill. • Rock Island, Ill. Wichita, Kan. • Kenilworth, N. J. • Hartford, Conn. • Tucumcari, N. Mex. Oklahoma City, Okla. • Tulsa, Okla.

LOCK JOINT
Reinforced Concrete
PRESSURE PIPE

It's always time for CHLORINATION





W&T SEWAGE CHLORINATOR

Chlorination time at a modern sewage treatment plant knows no hour or season — it's always the right time to use this versatile tool in the solution of the numerous problems the average operator faces every day. For example, chlorination *controls odors* at Fort Wayne, Indiana; reduces *filter ponding* at Rotterdam, New York; and *sterilizes the effluent* of the Easterly Sewage Plant at Cleveland, Ohio.

Best of all, the advantages of chlorination aren't expensive. The average installation represents less than 1% of total plant cost.

Why not make it "chlorination time" in your plant now. Call your nearest W&T Representative for the benefit of over 35 years' experience in chlorination, a full line of equipment for every sewage plant need, the practical knowledge gained in making thousands of installations, and the availability of a nationwide service staff.

S-50

WALLACE & TIERNAN
COMPANY, INC.
CHLORINE AND CHEMICAL CONTROL EQUIPMENT
NEWARK 1, NEW JERSEY • REPRESENTED IN PRINCIPAL CITIES